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Measuring destitution: integrating qualitative and quantitative approaches in the analysis of survey data

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Summary

Through detailed discussion of a methodology developed to quantify destitution in rural Ethiopia, the paper raises a number of issues and ideas concerning the integration of qualitative and quantitative approaches during survey analysis. It highlights the critical importance of using contextual data to inform quantitative analysis, for example in defining and scaling locally-appropriate indicators of such basic parameters as human capital and housing quality.

An index of physical labour capacity, adjusted for chronic illness and disability, is suggested as a more meaningful measure of household human capital in such a low-skill, low-opportunity livelihood system than the more commonly-used education or literacy variables. The potential application of this index to calculating "real" or effective household dependency ratios is also explored. The advantages and disadvantages of "qualitative" versus "objective" methods of weighting composite indices are compared.

Among the innovative aspects of the analysis is the triangulation of an "idea" destitution index constructed from discrete quantified variables with a subjective, holistic self-assessment of the household's status. The very high correlation of results from the two approaches validates both the methods and the findings, and exemplifies the value of combined data types in representing the multi-dimensional reality of extreme poverty.

In operationalising the livelihoods approach, the focus is on quantifying access to (not merely ownership of) key assets, and outcomes. Again, the importance of contextual data and of locally-appropriate interpretations of the framework's parameters emerges as of key importance. Although the discussion necessarily involves a degree of Ethiopia-specific information, the methods and issues raised are of much broader application to applied development research, and to the current "Q-squared" debate on combining methodologies.

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1 Introduction

This paper discusses the analytical methods used to estimate the scale of destitution among the population of rural Wollo[1] (northern Ethiopia), for a policy research project (the 'Destitution Study') commissioned by Save the Children (UK) Ethiopia and funded by the Department for International Development (DFID). A full description of the fieldwork and sampling methods, together with the results and implications of the research, can be found in the final study report (Devereux *et al.* 2003, Sharp *et al.* 2003). This working paper draws together methodological material used in Chapters 4 and 5 of the final report, together with more detailed discussion of the analytical options considered and decisions made, particularly in regard to defining indicators and constructing composite indices. Although these discussions inevitably involve a degree of Wollo-specific detail, the methodological issues and some of the solutions adopted are of broader interest to researchers on chronic poverty and food insecurity in other contexts.

The conceptual basis for the Destitution Study is detailed in a parallel Working Paper, *Conceptualising Destitution* (Devereux 2003). Situating the concept of destitution within current debates on the nature and measurement of poverty, and drawing on an adapted livelihoods framework, Devereux sets out the following working definition of destitution:

> Destitution is a state of extreme poverty that results from the pursuit of "unsustainable livelihoods", meaning that a series of livelihood shocks and/or negative trends or processes erodes the asset base of already poor and vulnerable households until they are no longer able to meet their **minimum subsistence needs**, they lack access to the **key productive assets** needed to escape from poverty, and they become **dependent** on public and/or private transfers.

The methodological challenge on which the current paper focuses was how to put this definition into operation: in other words, how to measure and combine the three component elements of the definition, in order to identify destitute households and thus estimate their number.

Qualitative and quantitative research methods were integrated throughout the design, data collection and analysis stages of the Destitution Study. As a general principle, we agree with White (2002a: 513) that 'there is a synergy between [quantitative and qualitative techniques] . . . That is, using the approaches together yields more than the sum of the two approaches used independently'. Further, given the specific research questions of this study, it was clear that neither qualitative nor quantitative methods alone would be able to capture the complex and multi-dimensional nature of destitution in Wollo. For policy purposes, it was crucial to estimate the scale and distribution of destitution: this could not be done through qualitative enquiry or purposive sampling. At the same time, understanding the causes and processes of destitution at household and community levels was equally important if recommendations were to be

[1] The study population was defined as the rural areas of three Administrative Zones – Wag Hamra, North Wollo and South Wollo – which together cover approximately the same area as the former Province of Wollo. For brevity this area is referred to as "Wollo".

made for reversing those processes. Such understanding could not be achieved through a one-off questionnaire survey, especially given the thinness of secondary and historical data: it needed more open-ended research instruments, a greater involvement of the informants in interpreting and describing their past and present lives, and a more flexible level of enquiry (ranging from individual case studies to whole communities and economic areas). Therefore, the data collection instruments designed for the study incorporated linked elements of both quantitative methods (a household survey using probability sampling and a standardised questionnaire) and qualitative or contextual methods drawn from PRA and anthropological experience (these included time-lines, wealth-ranking discussions, oral histories, and focus groups using tools such as matrices and mapping).

However, the value of integrating qualitative and quantitative work goes beyond the selection of field-work methods. A World Bank review of Poverty Assessments identifies three major ways of combining quantitative and qualitative approaches in practice, during the data collection, analysis and reporting stages of research: '**integrating** the . . . methodologies; **examining, explaining, confirming, refuting and /or enriching** information from one approach with that from the other; and **merging the findings** from the two approaches into one set of policy recommendations' (Carvalho and White 1997: 16, emphases in original).

This paper deals with the integration of quantitative and qualitative approaches during the analysis phase, which most closely equates to the second of Carvalho and White's three strategies. It details the methods and statistical procedures used to select and process data from the household questionnaire survey, in order to quantify destitution (that is, to estimate the number of destitute households within the sample and, by extrapolation, in the population as a whole). While this is primarily quantitative analysis, it will be seen from the discussions below that a great deal of qualitative information, mostly from the study fieldwork, was needed to select, interpret and cross-check the survey data.

The paper is divided into four main sections. Following this introduction, Section 2 first discusses the selection, interpretation, calculation and scaling of individual indicators of destitution, derived from the household questionnaire data. Section 3 then focuses on the methodological options and the choices made in constructing from these indicators a composite index which would enable us to distinguish "destitute" from "non-destitute" households, and thus to estimate the scale of destitution. Section 4 concludes, drawing out some points of general interest to other researchers.

2 Defining indicators of destitution

2.1 Selection of indicators: applying the livelihoods framework

This section gives an overview of how the livelihoods resource framework and the working definition outlined in the introduction were applied to the selection of indicators which could be used to quantify destitution. The household questionnaire was designed to collect quantifiable data on a range of variables relating to each of the definition's three dimensions: ability to meet subsistence needs, access to

productive assets, and dependence on transfers. The validity and reliability of these variables were assessed during the fieldwork (incorporating insights from the simultaneous qualitative work) and in the early stages of quantitative analysis, and a 'short-list' of indicators was produced.

Indicators of *ability to meet subsistence needs* were relatively unproblematic to select. They include indicators of food security (months of food shortage, and meals per day during the hungry season) and non-food needs (shelter, clothing, and household items). These are listed in Figure 2.1 and explained in detail in Section 2.3 below.

The third defining element, *dependence on transfers*, is represented in our analysis primarily by households' self-assessment of their overall (in)dependence and livelihood viability. This independent variable, as Section 3.4 explains, was used to triangulate an objective "destitution index" combining indicators of basic needs and resources. Data on households' actual *receipt* of transfers (including food aid) were analysed as characteristics or correlates of 'destitute' and 'non-destitute' households (see Chapter 7 in Devereux *et al.* 2003 or Sharp *et al.* 2003): they are not included in the destitution index, because of the circularity of taking receipt of transfers as a proxy of need or dependence. Simply put, those who are most in need of assistance may not have access to it, while those who have access to it may not be the most needy. Indeed, our assumption in measuring social capital is that the ability to call on networks and obligations is an important livelihood asset in itself, which may enable people to avoid or escape from destitution[2]. Therefore, quantifying people's receipt of transfers would indicate whether they have access to assistance, but would not show how badly they needed it or how dependent they were on it. At the same time, it could exclude those who were in need but did not receive transfers (who may in fact be among the most destitute). Social capital, which is discussed below as a category of livelihood resource, is also an indicator of households' *access* to transfers, but again does not measure dependence.

The remainder of this section discusses the selection of indicators relating to the middle element of the definition, *access to productive assets*. In selecting these indicators, there were two objectives: firstly, to identify the most meaningful and complete set of resource indicators for the current purpose (identifying the destitute), at household level, within the socio-economic context of Wollo; and secondly, to ensure that the indicators realistically reflected people's access to, not merely ownership of, these resources. As discussed in Devereux 2003, the Destitution Study draws on DFID's formulation of the livelihoods resources pentangle, which comprises *natural* capital ('the natural resource stocks from which resource flows useful for livelihoods are derived'); *social* capital ('the social resources . . . upon which people draw in pursuit of livelihoods'); *human* capital ('the skills, knowledge, ability to labour and good health important to the ability to pursue different livelihood strategies'); *physical* capital ('the basic infrastructure . . . and the production equipment and means which enable people to pursue their livelihoods'); and *financial* capital ('the financial resources . . . whether savings, supplies of credit or regular remittances or pensions . . . which provide [people] with different livelihood options') (Carney 1998: 7).

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[2] Compare Swift's (1989) identification of "claims" to various types of assistance as a vital component of the assets which determine rural people's vulnerability to famine.

However, the classification of specific assets under these headings is not always obvious, especially in agricultural contexts. The prime example is livestock, which has been classified by various researchers as physical, natural or even financial capital. For example, Ellis (in his case-study work on Tanzania) classifies livestock as financial capital on the grounds that animals embody a rural household's stock of wealth or savings, while he represents physical capital by housing materials (concrete or brick), piped water, mains electricity, means of transport (bicycles, motorcycles and four-wheel vehicles) and "tools of the trade" (Ellis 2000, Chapter 10). There is certainly an overlap in practice between financial and physical resources: indeed, Scoones (1998: 8) does not separate them, suggesting instead a single category of 'economic or financial capital' defined as 'the capital base (cash, credit/debt, savings, and other economic assets, including basic infrastructure and production equipment and technologies) which [is] essential for the pursuit of any livelihood strategy'. Clearly, the socio-economic context is a decisive element in deciding how exactly to translate the general framework of livelihood resources into specific measurement tools. For this study, the following pragmatic decisions have been made on the interpretation of the categories.

Physical (or, to use Scoones' helpful terminology, "economic") capital is understood here to mean productive assets which the household has produced, accumulated or invested in; which have a market value and can be liquidated through sale or exchange; and which can be used to generate future income or assets. Livestock fulfil these criteria in the household economies of rural Wollo. It was decided that infrastructural assets (roads, communications, protected water sources, etc.) were largely determined at community level and by geographical location, and would therefore not be useful in distinguishing destitute households from others[3].

Natural capital, on the other hand, is understood to mean the "given" resources or endowments of nature, which would include natural water sources, soil types, and natural forest or grassland. Again, some of these depend on location and are more useful in assessing assets at the community level. For households in rural Wollo, land is overwhelmingly the most important natural resource and was therefore selected as the most appropriate indicator of natural capital. Indeed, household farmland is more of a "given" stock in Wollo than it would be in most parts of the world, since under the Ethiopian constitution all land belongs to the state, and farmers only have usufructuary rights to "their" land; they cannot buy or sell it. The balance between ownership and access in this context is represented in the two indicators used, as discussed in Section 2.3.

Of course, it could reasonably be argued that since land can also be invested in, has a market value (through sharecropping and renting, even though it cannot be sold), and generates future income, it meets the criteria for physical or economic capital, just as livestock could be considered as natural rather than physical capital. The categorisation used here is pragmatic rather than definitive. The construction and analysis of the composite index described in Section 3.3 is not affected by which column of the framework a variable is placed in.

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[3] Geographical factors, particularly remoteness from all-weather roads and from district towns, were analysed as correlates rather than defining characteristics of household destitution (see Sharp *et al.* 2003, Section 7.4).

Financial capital has been taken to mean simply access to money (other than income generated by sales of produce, labour and other commodities). Ellis' point that livestock are a major form of saving is a valid one, but in the context of this study it was decided that access to cash is both a different and an important factor, and should therefore be represented separately.

Our interpretations of social and human capital closely follow Carney's definitions, quoted above. Social capital, as well as forming one point of the resource pentangle, also functions as an indicator of access to informal transfers (that is, transfers from the community or relatives rather than from government and aid organisations).

Based on these broad interpretations, an initial selection was made from the questionnaire data of seventeen suggested indicators relating to the first and second elements of the working definition, as shown in Figure 2.1 below. These were then further refined and explored, as discussed in Section 2.3.

Figure 2.1 Preliminary selection of indicators

Element of definition	***ABILITY TO MEET MINIMUM SUBSISTENCE NEEDS***		***ACCESS TO KEY PRODUCTIVE ASSETS ****				***ACCESS TO TRANSFERS***
Dimension	***Food security*** ⇩	***Other needs*** ⇩	***Human capital **** ⇩	***Natural capital*** ⇩	***Physical capital*** ⇩	***Financial capital*** ⇩	***Social capital*** ⇩
Indicators	1) Meals per day during hungry season	3) Clothing purchases	6) House-hold labour capacity	9) Farmland owned	11) Oxen owned	14) Access to cash credit	16) Access to social support networks
	2) Months of seasonal food shortage	4) Housing quality	7) Male adult labour	10) Land cultivated	12) Access to draught power	15) Access to cash gifts or remittan-ces	17) Participa-tion in social institutions
		5) Basic expenditure items	8) Access to non-household labour		13) Total livestock owned		

**** Note:*** *In this context, the terms "assets", "capital" and "resources" are used interchangeably.*

2.2 Scaling of indicators: setting locally appropriate thresholds

In order to compare the levels of inherently different variables (for example, land-holding and human capital), compatible scales of measurement are needed. This is also essential if the indicators are to be added together in some way to construct composite indices, as discussed in Section 3 below: otherwise, the different measurement scales will introduce distortions by acting as unintentional and inappropriate

weights. For analysis of the individual indicators it is, of course, appropriate to use the original data range in the indicator-specific unit of measurement (land in hectares, seasonal food shortage in months, and so on). However, when the indicators are to be compared or combined, they will be scaled from 0 to 1 as explained below.

The basic formula for scaling a variable from 0 to 1 is:

$$\frac{X_i - X_{min}}{X_{max} - X_{min},} \quad \text{i.e.} \quad \frac{\text{(actual value – minimum value)}}{\text{(maximum value – minimum value)}}.$$

For indicators where a high value is "bad" and a low value "good" (for example, number of months of food shortage), this formula should be inverted: $\frac{X_{max} - X_i}{X_{max} - X_{min.}}$

The maximum and minimum values used in these formulae can either be taken from the actual data ranges, or they can be threshold values chosen according to the context and purpose of the index. Probably the best-known example of the latter approach is the UNDP's human development index, or HDI (Anand and Sen 1994; UNDP 2001). The components of the HDI are scaled according to "goalpost" values which set both a framework for international comparability and a target against which countries' progress can be measured year on year. For example, the life expectancy index is calculated with a minimum value of 25 years and a maximum of 85, while the goalpost for per capita GDP is set at PPP US$ 40,000[4] (and adjusted by logarithm) on the grounds that 'achieving a respectable level of human development does not require unlimited income' (UNDP 2001: 240).

Comparability across time and space (for example, between years and between regions) will be an advantage for the destitution study indices if the methodology is replicated in future. However, for the immediate purpose of estimating the current scale of destitution in rural Wollo, there is a more important advantage of setting "goalpost" maxima and minima. It has the effect of focusing the calibration of the scale on the data range between the selected thresholds, so that a more detailed breakdown is given of the differences among households within that range. Since the major purpose of the analysis was to distinguish the destitute from the generally poor population, the data ranges used here have been truncated to focus on the poorer end of the socio-economic distribution. In general, "goalpost" maxima have been set at levels which represent a relatively well-off, or clearly non-destitute, point on each particular indicator (see Section 2.3 for details).

A general effect of using scaled indices is, of course, to convert the variables to relative rather than absolute values. This aids comparability, but it must be remembered that the indices should be interpreted within the socio-economic context of rural Wollo, where even the relatively well-off are poor by international standards.

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[4] PPP = 'Purchasing power parity', a rate of exchange that accounts for price differences across countries, allowing international comparisons of real output and incomes. This means that PPP US$ 1 has the same purchasing power in the domestic economy as US$ 1 has in the United States (UNDP 2001: 254–5).

Section 2.3, which follows, discusses the specific definition of and rationale for each of the indicators short-listed for inclusion in a composite "destitution index" for Wollo, together with the maximum and minimum values set for scaling. Extracts from the questionnaire, showing the questions from which the data for each indicator were derived, are given in Appendix 1 and cross-referenced in the paragraphs below by section and question numbers. This discussion, of necessity, contains much locally-specific detail: nevertheless, the process of decision-making and the use of contextual or qualitative information in specifying exact variables and thresholds (as well as some of the indicators themselves) are of more general application.

2.3 Detailed discussion of indicators

2.3.1 Basic needs

Indicator 1) Number of meals per day during the last hungry season

The variable collected is the number of meals per day eaten by household members during the worst period of the previous year's hungry season *(questionnaire section G1, q.82)*. The range of possible answers in the raw data is from 0 (= sometimes went a whole day without eating) to 4 (= more than 3 meals a day). Note that the agricultural year preceding the survey was a relatively "normal" one (not a major drought or food crisis year) throughout the study area: therefore, the severity of that year's hungry season is expected to reflect households' underlying poverty and the chronic nature of their food insecurity, rather than a short-term emergency.

The question was asked separately for adults and children[5] in the household because, from prior knowledge of the study population, it was expected that households would tend to cut adult consumption first and more severely in order to protect the consumption of children. A first glance through the questionnaires during field editing appeared to bear out this hypothesis. In defining the indicator, a decision had to be made about whether (and if so, how) to combine the responses for child and adult meals. One option was to take a simple average of the two, taking care to adjust for households with no children. This would give equal weight to cuts in adult and child consumption: however, as explained above, this does not appear to reflect the reality of household decision-making. It was also felt that this approach would distort the value of the indicator for childless households relative to those with children. A second option would, of course, be to assign non-equal weights to the adult and child variables. However, it was felt that there were inadequate data to decide what these weights should be, and the problem of comparability between households with and without children would remain. The solution adopted was to define the indicator as the number of *adult* meals only. Since all the sampled households contain adults,[6] this avoids the problems of comparability and of the relative weight of adult and child

5 For this question, "children" were defined as working-age or school-age children, not infants and toddlers who may eat frequent small snacks during the day.

6 Child-headed households, which have become a common and problematic feature of societies severely affected by HIV/AIDS, do not (yet) appear to exist in the communities surveyed.

consumption – with the implicit assumption that consumption-cutting decisions are broadly similar in motivation and significance for households with or without children. This appears *a priori* to be a reasonable assumption. International food security research has found that cutting the number of adult meals is one of the commonest immediate responses to food stress for people in widely differing circumstances. Childless households in our sample may cut the number of meals in order to protect their longer-term survival, welfare, or assets; while those with children will have the same pressures, plus the additional constraint of feeding their children.

Table 2.1 Scaled values for indicator 1 (meals per day)

Data value (Number of meals per day at peak of last hungry season)		**Scaled value**
max (truncated)	3+	1
	2	0.6
	1	0.2
min (actual)	0	0

In order to scale this variable, the data-range was truncated at 3, so that the maximum value is equivalent to three or more meals a day. For the calculation of scaled values (applying the general formula above) the minimum value was set at 0.5, since the "zero" response in this variable is not a true zero but simply a data code representing less than one meal per day on average. The resulting scaled values are shown in Table 2.1. Note that raising the minimum value gives relatively greater emphasis to values at the lower (destitute) end of the scale. For example, a household which cut its adult consumption to one meal per day scores 0.2 on this indicator if the minimum is set at 0.5, compared to 0.33 if the minimum is set at 0.

Indicator 2) Duration of seasonal food shortage

The questionnaire *(Section G1, q.83)* records the number of months of food shortage the household experienced during the previous hungry season. This was treated as a simple continuous variable, constituting the second food security indicator. For scaling, the actual minimum data value of 0 (i.e. no food shortage) was used, and the maximum was truncated at 6 (so that all households reporting a food shortage lasting 6 months or more were grouped together). Again, the effect of applying this cut-off point

to the data is to focus the indicator on the poorer end of the scale. For example, a household reporting 7 months of food shortage would score 0 on the truncated scale, compared to 0.42 if the indicator is scaled over the whole 12-month range.

Table 2.2 Scaled values for indicator 2 (months of food shortage)

Data value (Months of food shortage in the past 12 months)		Scaled value
min (actual)	0	1.00
	1	0.83
	2	0.67
	3	0.50
	4	0.33
	5	0.17
max (truncated)	6 +	0.00

Note that the inverted formula is used here (see 2.3 above): the scaled values are thus inverted in relation to the raw data, in order to be compatible with the other indicators (so that higher values on the scale are positive or "non-destitute", lower are negative or "destitute").

Indicator 3) Clothing purchases during the last three years

As with indicator 1 (number of meals), the question 'How many times has your household bought clothes during the past three years?' was asked separately for adults' and children's clothing *(questionnaire Section G3, q.87 and q.88).* Based on the national researcher's prior knowledge of Wollo society, it was suggested that a minimum level of socio-economic respectability would be represented by buying clothes, at least for the children, at least once a year (at New Year)[7]. Conversely, inability to buy clothes once a year would indicate poverty or deprivation. If a household is unable to buy clothes for both children and adults, the hypothesis is that they will tend to prioritise the children.

Table 2.3 Scaled values for indicator 3 (clothing)

Data value (Number of times clothing was purchased in the past 3 years)		Scaled value
max (truncated)	3 +	1
	2	0.6
	1	0.2
min (actual)	0	0

[7] Yared Amare, pers. comm.

The same dilemmas therefore arise, as to whether and how to combine the answers for adults and children, and how to treat childless households (see the discussion above). After discussion, the same approach was adopted as with the number of meals, i.e. that the response for adults only *(q.87*) should be taken as the basic indicator, which applies to all households without the need for assigning weights to adult and child answers.

The range of possible answers in the questionnaire is from 0 to "4 or more". For scaling, this range will be truncated to a maximum value of 3 (equivalent to purchasing clothes once a year or more).

Indicator 4) Housing quality

Information on housing quality was collected in Section G4 *(q.90 and q.92)* of the questionnaire. It is common in household surveys to use types of construction material to differentiate wealth, but in our study area the materials used for building were found to be determined as much by location (and consequent availability of different materials such as wood, stone, or metal sheeting) as by a household's wealth. Also, different materials are preferred in different places: for example, it was reported that a metal roof may be a sign of relative prosperity in South Wollo, but the opposite is true in Wag Hamra where thatch is considered superior. In Delanta (a district of North Wollo) the increasing prevalence of metal roofs was attributed by local informants not to rising wealth but to the high rate of theft and fire-setting (traditional thatch being very vulnerable to both these disasters).

Table 2.4 Scaled values for indicator 4 (housing quality)

Category	Scaled value
Roof and walls both in good condition	1
Either roof *or* walls in good condition	0.5
Roof and walls both in poor condition	0

Given these empirical observations, it was decided that construction materials would not be a useful indicator for the purpose of distinguishing between destitute and non-destitute households in rural Wollo. Instead, a simple indicator of housing quality was constructed from questions 90 and 92, which ask about the condition respectively of the roof and walls[8]. Each one is a dichotomous variable, having only two possible answers: "good / adequate condition" (coded 1 in the questionnaire) or "poor condition – inadequate protection from weather" (coded 2 in the questionnaire). In the Ethiopian highlands, where the climate alternates between very strong sun and bitterly cold wind, rain and even hail, protection from the weather has a significant impact on people's health and quality of life.

In order to scale this indicator, all that is needed is to recode to 2=0, and then calculate a simple average of the two values (roof and walls). This gives three possible scaled values, as shown in the table.

[8] If the household had more than one *tukul* (domestic building), the interviewer was instructed to record the answer for the one in best condition.

Indicator 5) Basic expenditure items

Section G5 *(q.93 to q.96)* of the questionnaire asked which of the following basic commodities were present in the household at the time of interview: salt, coffee beans *(buna)*, coffee husks *(jemfel)*, and kerosene[9]. The rationale is that these are relatively small items of recurrent cash expenditure, which all households would want to have if they could afford them. Their absence was therefore taken to indicate a severe cash constraint [10, 11].

Table 2.5 Scaled values for indicator 5 (basic expenditure items)

Data value (Total number of listed items present in the house at time of survey)		Scaled value
max (truncated)	3 +	1
	2	0.67
	1	0.33
min (actual)	0	0

To calculate this indicator, the "No = 2" response in the raw data was first recoded to 0. A simple total of responses to *q. 93* through *q.96* (i.e. a count of the number of items present) was then taken, and scaled from 0 to 1 using the general formula above. The data range is truncated to give a maximum value of 3, because *buna* and *jemfel* are substitutes (generally found in different locations and cultural contexts, with Moslems often preferring *jemfel*). The resulting scaled values are set out in Table 2.5.

2.3.2 Human capital

The educational level of the household head (or more rarely household members), measured by literacy or school grade achieved, is often used as a proxy for "human capital". This was, however, rejected as a core indicator of destitution, since literacy rates are generally so low in rural Wollo that they do not distinguish the poorest from their neighbours. Neither is education a key livelihood asset for the current generation of the poor, because of the very limited opportunities for employment or enterprise. Capacity for physical

9 Kerosene is used for lighting, but not as a cooking fuel, in rural Wollo. The type of cooking fuel is another indicator which is commonly used in wealth indices (UNICEF 2000, White 2002b, Filmer and Pritchett 1998), but which was not found to be a useful distinguisher of economic status in this particular study area, where wood and dung (rarely charcoal) are the universally used cooking fuels. While access to dung could to some extent be a wealth indicator, it is also partly determined by altitude and location (which influence the predominance of cattle in the local farming system). To the extent that availability of dung at the household level may be a wealth indicator, it can be considered proxied by livestock ownership (indicator 13).

10 During the survey, several interviewers reported cases where the household did not have any of these items on the day of the interview, not because of poverty but due to poor market access, or because they had just run out and were planning to buy them at the next day's market. It is assumed that such cases will not introduce a significant bias over the whole sample. It is also possible that some respondents gave this reason because they were embarrassed not to have these things in the house.

11 Interviewers also commented that kerosene, even in the very small quantities used in local lamps, was considered more a luxury than a basic essential in some communities. This point will not significantly affect the interpretation of the indicator, though it is likely to affect the distribution of the variable values.

work is by far the most critical requirement for most of the available livelihood options (a constraint which falls doubly hard on people with disabilities or chronic illness). The indicators selected for the estimation of destitution, therefore, focus on access to physical labour-power rather than skills or schooling.[12]

Indicator 6) Household labour capacity

The first indicator under the human capital dimension of the framework is a measure of the total physical labour capacity of the household. The standard method of estimating household size, labour power and dependency is simply to count the number of individuals whose age falls in defined "working-age" or "dependent" ranges. This was felt to be inadequate for the purpose of this study, since "working-age" is close to meaningless in a country with one of the highest child-labour rates in the world, and where the old generally work until they drop. Age-based labour categories also ignore illness and disability, which are crucial to people's actual capacity to work.

More nuanced measures of household size and composition can be constructed using "adult equivalent scales" based either on nutritional needs or overall consumption (taking account of characteristics such as age and gender). These scales are discussed in Appendix 3 in the context of dependency-ratio calculations but, being focused on relative *consumption* needs, they are of limited use in measuring human capital as a *productive* resource.

In place of the standard methods, therefore, the Destitution Study has taken an innovative approach to estimating the actual labour capacity (i.e. physical human resources) of households, based on respondents' own assessment of the labour contribution that individuals are able to make to the household livelihood. Table 2.6 shows the pre-coded categories used in the questionnaire *(Section A1, q.7)*, along with the labour-capacity values assigned to each during the analysis. These values were derived initially from anthropological work by Yared Amare in North Shewa and South Wollo, combined with observations and cases from the qualitative fieldwork for the Destitution Study. Dr. Yared's original age-based weights are: small child (less than 6 years old) and "retired person" (over 60) = 0; working child (6–10) = 1; adult assistant (10–13) = 2; and adult (over 13 years old) = 3. The scale defined here uses the same ratios, but with the following adaptations: "1" is set equal to an able-bodied adult equivalent; an additional weight is added for the working elderly (set at 0.5, based on the qualitative fieldwork); and, crucially, the categorisation of individuals is determined not by age but by the informants' own assessment of their health and ability.

[12] This does not imply that education is unimportant: on the contrary, it is a critical investment priority for the future of Ethiopia (including the future of the current generation of children). Survey data were also collected on each household member's functional literacy, current school attendance, and years of school completed.

Table 2.6 Conversion factors for individual labour capacity

Category	Explanation	Conversion factor ("labour capacity units")
Child	*too young to work*	0
Working child	*e.g. herding livestock; doing domestic chores including childcare; may be hired or fostered out*	0.3
"Adult assistant"	*e.g. boys helping in the fields but not ploughing, girls helping in the kitchen (making sauce but not the staple dish)*	0.6
Adult	*able to do a full adult workload*	1.0
Elderly	*working, but not able to do a full adult workload*	0.5
Permanently disabled	*unable to work*	0
Chronically ill	*unable to work for the past 3 months or more*	0

For the purpose of measuring labour capacity (as opposed to consumption needs), this approach has a number of advantages over the more conventional techniques:

- It takes account of health status: disabled and chronically ill people who are "unable to work" are not counted among the household's labour force, regardless of their age group. These categories include the mentally disabled and ill, although no separate questions were asked about this sensitive subject.
- It recognises the reality that, in rural Wollo, young children and elderly people are usually working, unless they are ill or, in the case of secondary school students, making long and time-consuming journeys to school (or living elsewhere for the duration of their schooling).
- It also recognises the variation among individuals, particularly the elderly: one 65-year-old may indignantly insist that they are in their prime and doing the same work as a 40-year-old, while another person of 50 would consider themselves elderly and "unable to do a full adult workload" (numerous such cases, of both types, were reported by the interviewers).

Despite these advantages this is an experimental approach, and its validity should be carefully explored and tested.[13] Since data were also collected on the age and gender of all household members, it would be possible to examine the relationship between age groups and the labour capacity codes. This would be a useful exercise in itself, for the light it may shed on factors such as child labour. A further issue to

[13] With hindsight, the labour-capacity codes should have been further disaggregated to classify the chronically ill and disabled as either *'completely unable to work'* or *'working intermittently / unable to do a full adult workload'*. Pregnant and breast-feeding women should also, perhaps, have been allocated a separate category.

investigate is the possibility that children and the elderly are more likely to be working in poorer households: if this hypothesis is correct, the method suggested here may bias the indicator towards overestimating the labour capacity of poorer households.

After recoding the raw questionnaire responses for each individual to the conversion factors above, these were summed to give a measure of each household's total labour capacity. For scaling, the actual data minimum of 0 [14] was used, while the maximum was truncated at 5 adult equivalents (a prosperous level of household labour in Wollo, where the crude household size averages approximately 4.5 individuals). This is a continuous variable: Table 2.7 gives some indicative examples of possible values and their scaled equivalents.

Table 2.7 Scaled values for indicator 6 (household labour capacity)

Data value (examples)* **(Total household labour capacity units)**		**Scaled value**
max (truncated)	5 +	1.00
	4.2	0.84
	4	0.80
	3.6	0.72
	3	0.60
	2.5	0.50
	2	0.40
	1.3	0.26
	1	0.20
	0.5	0.10
min (actual)	0	0.00

* *Note:* Since this is a continuous variable, the values shown here between the minimum and maximum are examples only: a large number of intermediate values are also possible.

A further, and potentially widely useful, application of this labour-capacity index is to calculate an adjusted or "real" household dependency ratio, which is appropriate to local working lives and takes account of disability and chronic illness, in place of the standard age-based ratio. Applying the adjusted ratio in the Destitution Study analysis revealed that, when chronic illness and disability are taken into account, destitute households have higher dependency ratios than non-destitute households even though they are smaller (see Devereux *et al.* 2003 or Sharp *et al.* 2003, Chapter 7 for a discussion of these findings). The rationale and methodology for the adjusted dependency ratio calculation are given in Appendix 3.

[14] A small number of households did report that they had no labour power at all. This means that all household members are either disabled, chronically ill, or too young or too old to work.

Indicator 7) Presence of male adult labour

The second indicator of human resources is a dichotomous variable indicating whether or not the household contains at least one able-bodied adult male (1=Yes, 0=No). This variable was derived from *questionnaire Section A1 q.6* (gender of household members, coded male = 1) and *q.7* (labour capacity, coded adult = 4). This indicator is proposed because the absence or loss of male adult labour was frequently cited during the qualitative field-work as a cause of impoverishment for female-headed, disabled, and elderly households. Without at least one able-bodied man, a household cannot plough its own land and must either sharecrop it out or rely on non-household labour (whether free assistance from friends and relatives, hired labour, or various kinds of exchange). Its access to other livelihood strategies (such as local urban labour, trade, and seasonal migration[15]) is also severely constrained, as is its ability to participate in reciprocal working parties (an important non-monetary means of accessing additional labour).

Since this indicator is calculated as a simple Yes/No (1 / 0) value, no scaling is needed.

Indicator 8) Access to paid non-household labour

A similar dichotomous (Yes/No) variable indicates whether or not the household accesses additional labour through various hiring or exchange mechanisms. This indicator is derived from *Section D.1, q.33*, which asks about sources of labour for crop farming, livestock keeping, domestic and other types of work during the past twelve months. A household is coded Yes (=1) on this variable if their responses include any one or more of the following four labour sources: daily hired local labour; long-term hired local labour; hired migrant labour; or "festive work parties".

Other possible sources of non-household labour (unpaid help from friends and relatives, sharecroppers, and reciprocal work arrangements) are excluded from this indicator. Access to unpaid help is considered as social capital, while 'reciprocal or exchange work parties' *(response code 7 in q.33)* are excluded on three grounds. Firstly, unlike the four labour sources included in this indicator, they do not usually involve any payment in money or kind[16]. Secondly, since the ability to access labour through reciprocal arrangements is largely determined by the household's own labour capacity (especially male labour, as mentioned above), their inclusion here may constitute double-counting or excessive weighting of this factor. Thirdly, participation in reciprocal work parties is included under social institutions (indicator 17).

Indicator 8 thus broadly represents a household's (in)ability to *pay* (in cash or kind) for labour. Preliminary analysis of the data showed that only 40 per cent of the sample households had accessed additional labour in these ways during the past 12 months. Therefore, this indicator does not in itself help

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15 From the qualitative field-work, it is clear that (in Wollo) men are much more likely to go on seasonal or circular labour migration and return periodically to support their households. Women who migrate tend to leave the home village permanently and form households elsewhere.

16 "Festive work parties", by contrast, require the host to provide food and drink to quite large numbers of people in exchange for labour. Both the questionnaire data and qualitative discussions suggest that relatively few people have been able to afford this in recent years, while participation in reciprocal groups remains relatively frequent and is accessible to any household with the physical capacity to work.

to identify destitute households among the 60 per cent who did not pay for labour. It does, however, help to raise the resource score of households who, though short of labour, have the means to hire others.

2.3.3 Natural capital

Indicator 9) Farmland owned

The first indicator of natural capital is the total area of farming land owned by all members of the household (that is, land to which they have legal title recognised by the local government and on which they pay tax) [17, 18]. The questionnaire *(Section D2, q.35)* records the size of farming land in *timads* [19]. For scaling, the minimum is set at the actual data value of 0 and the maximum is truncated at 6 *timads* (roughly equivalent to 1.5 hectares). This threshold maximum was based on the qualitative fieldwork, but also matches quite well with the questionnaire data: preliminary analysis showed that only about 6 per cent of households in the whole sample owned more than 6 *timads* (1.5 ha) [20]. Applying the general scaling formula with these minimum and maximum values gives the scaled values shown in Table 2.8.

Table 2.8 Scaled values for indicators 9 and 10 (farmland owned and cultivated)

Data value * (Size of farming land, in hectares)		Scaled value
max (truncated)	1.5+	1.00
	1.25	0.83
	1	0.67
	0.75	0.50
	0.5	0.33
	0.25	0.17
min (actual)	0	0.00

* *Note:* Since this is a continuous variable, the values shown here between the minimum and maximum are examples only: a large number of intermediate values are also possible.

17 As noted above, under the Ethiopian Constitution there is no private ownership of land: user-rights are allocated by the state through the *kebele* or local government. However, no difficulty or ambiguity was encountered in asking about "ownership" within this tenure system.

18 Note that the indicator excludes grazing land. Although a separate question *(q.36)* was asked about the size of grazing land owned, this was found to be a much more complex issue than the questionnaire allowed for, due to wide variation not only in local measurement units but also in tenure systems. Some *kebeles* were found to have only common grazing land, some had only private grazing (allocated and measured in various ways), and some had both. Access to grazing land is an important factor in household livelihoods, but given these complications it was not feasible to include it as an indicator. To some extent, access to grazing or fodder should be captured in the indicators of livestock ownership (indicators 11 and 13).

19 A *timad* is a local unit of measure meaning the area that can be ploughed with one pair of oxen in one day. Although this area actually varies depending on factors such as slope and soil type, a standard conversion rate of 1 *timad* = 0.25 hectare is used by Ministry of Agriculture staff throughout the study area, and is therefore applied in this analysis. Other measurement units were very rarely used for farming land.

20 It should be noted that this "maximum" size is a relative value based on the observed reality of land-holdings in Wollo, not an absolute or target size which would enable a household to support itself through farming. To give some frame of reference, experienced farmers in Geja (Debre Sina Wereda, South Wollo) reckoned that, in their village, 6 *timads* (1.5 ha) of average fertility – the maximum they thought any one household now controlled – would be enough to feed a family of five for seven months (after deducting seed, but without any allowance for tax or other cash needs).

Indicator 10) Farmland cultivated

The second indicator of land access is the area *cultivated* by the household during the most recent agricultural season *(questionnaire Section D3, q.37)*. area cultivated is often different from the area owned. A household may own land but sharecrop (or rent) out all or part of it because they lack the labour, draught power or inputs to farm it; while on the other hand, landless households (typically young people, or sometimes migrants, who have married or arrived since the last land redistribution) may nevertheless manage to farm by sharecropping or renting in. Relatively successful or labour-rich households with land may also sharecrop or rent in additional fields, thus cultivating more than they own. Therefore the size of land cultivated indicates both a household's *access* to land (whether through ownership or other institutional arrangements), and their *capacity* to farm it.

The scaling is the same as for indicator 9, explained above.

2.3.4 Physical capital

Indicator 11) Oxen owned

Ownership of plough oxen is universally used as an indicator of relative wealth in Wollo, and oxen are the productive asset people most often aspire to own when they are able to accumulate some capital. The importance attached to owning oxen was confirmed by discussion groups and informants in all the qualitative sites, even in areas where few people in fact now own them and where it has become common to plough with other animals.

The number of oxen owned was therefore explored as an indicator separately from total livestock, which is measured in indicator 13. For scaling, the data range was truncated at a maximum of one pair of oxen, so that any household owning two or more oxen scored 1 (representing an adequate or clearly non-destitute level of this particular asset). This gives three possible scaled values, as shown in Table 2.9.

Table 2.9 Scaled values for indicator 11 (oxen owned)

Data value (Number of oxen owned)		**Scaled value**
max (truncated)	2 +	1.00
	1	0.50
min (actual)	0	0.00

A preliminary analysis of the data showed that 41 per cent of the sampled households have no oxen, while a further 32 per cent have only one. The level of oxen ownership is therefore not, on its own, useful in distinguishing the destitute or poorest households.

Indicator 12) Access to draught power

As just noted, most farming households in Wollo do not own a pair of oxen. They have to rely on other means of accessing draught power for ploughing – whether by pairing single animals with neighbours, borrowing, renting, or exchanging other commodities (such as labour or fodder) for oxen use. Other animals (especially young bulls, cows and horses) are also increasingly used for ploughing. In addition to the number of oxen owned, therefore, a broader measure of households' *access* to draught power was tested.

For this purpose a simple dichotomous indicator was constructed, registering whether or not a household was able to plough with animals during the most recent farming season *(questionnaire Section D.4, Q.39)*. This indicator includes any type of animal used for ploughing (not only oxen), and any type of institutional access to draught power (borrowing, sharing, renting or exchange as well as ownership). It also implicitly assumes access to the plough itself, through the same arrangements. A household scores 1 on this indicator if their reply to *q.39* ('If you used animals, what type of animals did you use?') indicated *any* animal(s) (data codes from 1 to 6). A household scores 0 if *no* animals were used.

A potential complication in interpreting this indicator is that it is only applicable to households who cultivated last season, and adds nothing to our understanding of the livelihoods or assets of the 12.8 per cent of households who were not farming. Before addressing this problem, however, the usefulness of the indicator was tested by exploring how closely it is correlated with land cultivated (indicator 10). From the qualitative work it was clear that draught animals are almost essential to farming in the study area: hand-hoeing is only a realistic option on very small or steep fields, or for some high-value crops grown on rare, small irrigated plots. Thus we expected the questionnaire data to show that almost everyone who was farming managed to access a plough team somehow, implying that those who could not gain access to draught power could not farm.

This hypothesis was confirmed by simple correlation analysis, comparing the households who farmed last season (i.e. all those for whom indicator 10, "land cultivated", was greater than zero) with those who ploughed with animals (indicator 12, as described above). The two indicators proved to be very highly correlated.[21] Therefore, it was concluded that access to draught power is already adequately captured in overall ability to farm (indicator 10), and that the separate indicator is superfluous. Mathematically, including two such highly correlated indicators would cause problems of multicollinearity. Indicator 12 (access to draught animals) was therefore not included in the composite indices discussed in Section 3.

Indicator 13) Total livestock owned

The third proposed indicator of physical or economic capital is total livestock ownership. In order to sum different species of animal, Tropical Livestock Units (TLUs) – an equivalence scale based on an animal's

[21] The Pearson correlation coefficient is 0.966. A simple test of association shows that out of the 1,854 sampled households who cultivated last season, 1,838 (99.1 per cent) had access to draught power.

average biomass (feed) consumption – were chosen as the common measurement unit. The relevant TLU conversion factors for the types of livestock reported in the questionnaire *(Section D5, q.43)* [22] are shown in Table 2.10.

Table 2.10 TLU (Tropical Livestock Unit) values for Ethiopia

Animal type	TLU value
Sheep	.09
Goat	.09
Plough ox	1.10
Cow	.80
Heifer	.50
Bull	1.10
Calf	.20
Donkey	.36
Horse	.80
Mule	.80

Source: ILRI (International Livestock Research Institute)

Economists might argue that market prices would be a more relevant denominator for aggregating livestock as an economic resource. In practice, however, livestock prices for areas like Wollo are highly seasonal, and very variable both geographically and from year to year. Markets are thin and prone to collapse during periodic drought or other crises. Spatial integration is poor: virtually all livestock is taken to market on the hoof, so that proximity to roads and markets has a marked effect on an animal's price. In these conditions even accurate price data are difficult to interpret, and in fact the available data are patchy and of unreliable quality. It was therefore not considered satisfactory to use prices in this context.

At the same time, the bio-physical scale of TLUs has its own advantages for our purpose. It is standardised and widely used. It is consistent with the physical, rather than price-based, measures we have applied to other assets (labour and land). Further, the equal weight given to sheep and goats in this scale appropriately reflects their equivalent role and importance in the highlands (sheep country) and lowlands (goat country), enabling us to compare asset levels across the study area.

For scaling of this indicator, we use the actual minimum value of 0 (no animals owned), while the maximum is truncated at 6 TLUs (i.e., all households with 6 or more TLUs score 1 on this indicator). This maximum is roughly equivalent to a household herd of 10 sheep or goats, 2 oxen, 1 cow, 1 heifer, 1 bull, 1 calf and 1 donkey. Such a herd would place a household in the better-off rank in any of the communities visited, and is therefore considered a clearly adequate level of resources. Like land and labour, total

[22] Camels were listed in the questionnaire but are not included here, as (rather surprisingly) no-one reported owning any.

livestock is a continuous variable with many possible values: Table 2.11 gives some indicative examples of possible values and their scaled equivalents.

Table 2.11 Scaled values for indicator 13 (livestock owned)

Data value * Total livestock units (TLUs)		Scaled value
max (truncated)	6 +	1.00
	5	0.83
	4	0.67
(e.g. 2 oxen & 1 cow)	3	0.50
(e.g. 10 goats, 1 bull & 1 heifer)	2.5	0.42
	2	0.33
(e.g. 1 cow, 1 donkey & 4 sheep or goats)	1.52	0.25
(e.g. 1 cow & 1 calf)	1	0.17
(e.g. 6 sheep)	0.54	0.09
(e.g. 1 heifer)	0.5	0.08
min (actual)	0	0.00
* *Note:* Since this is a continuous variable, the values shown here between the minimum and maximum are examples only: a large number of intermediate values are also possible.		

Preliminary analysis of the data showed that only 4.5 per cent of the sampled households reported owning 6 or more TLU equivalents, while nearly one in five (18.4 per cent) said they owned no livestock at all.

2.3.5 Financial capital

As discussed above in Section 2.1, financial capital has been defined for this study simply as access to cash. In practice this was found to take the form of loans (with or without interest) or gifts (whether from within the community or as remittances from elsewhere). Opportunities for cash savings are virtually non-existent in rural Wollo, where banks are unknown. In the social institutions section of the questionnaire, only ten households (out of 2,127) reported participation in the most common indigenous financial institution, the rotating savings club (*equb*). As far as the qualitative team could determine, there were no *equb* operating in the villages: the few cases of individuals' participation were probably linked to recent or periodic urban residence.

The Ministry of Agriculture does provide credit arrangements for its extension packages, and data on household participation in this programme were collected during the survey: however, it has been

excluded from the measurement of financial capital for two reasons. Most importantly, the credit is given in kind (fertiliser and/or improved seed) and is therefore not a source of *financial* (cash) capital.[23] A further reason is the local variation in the availability and conditions of the extension package. Inevitably, given the topography and infrastructural constraints in Wollo, some areas have been more thoroughly covered by the extension programme than others, and farmers in some villages said that the package had not been available at all. This geographical variation would distort the usefulness of the credit indicator at household level.

Indicator 14) Access to cash credit

The first selected indicator of financial capital, access to cash credit, is a simple dichotomous variable (yes = 1, no = 0) indicating whether or not any member of the household had received a cash loan from any formal or informal source during the past 12 months[24]. Formal interest-bearing loans from sources such as ACSI,[25] government departments and NGOs are recorded in *questionnaire Section E1, q.52*. Informal interest-free loans from neighbours, relatives, religious organisations etc. are recorded in *questionnaire Section F3, q.69*.

Because credit is a two-edged sword which may impoverish rather than enrich vulnerable debtors, households who said they had borrowed money *but were unable to repay it* (data code 4 in *q.58*) were given a score of 0 on this indicator. The very limited credit access reflected in the questionnaire data, together with the qualitative fieldwork, confirm that the extremely low level of financial capital in rural Wollo is linked to poor people's fear and suspicion of debt as well as to very thin and imperfect financial markets and institutions.

No scaling is needed for this indicator, since it is dichotomous.

Indicator 15) Access to cash gifts or remittances

The second indicator of financial capital is receipt of cash gifts or remittances. Like the credit indicator, this is defined as a simple yes/ no indicator of whether the household received any gift or remittance in the form of money during the past twelve months. The data are taken from questionnaire sections *F3 q.69* (informal transfers) and *B2 q.19* (income proportions): a score of 1 is given if the household reported receiving either cash gifts or remittances.

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23 At least one case was encountered where a farmer had been obliged to take the package on credit, but had immediately sold it in the local market and exchanged the money for foodgrain (at a considerable loss, and with the debt still to pay). However, liquidation of the extension package is clearly not the intention of the policy-makers, and is not an efficient source of financial capital. Our discussions with farmers during fieldwork suggested that progress has been made in correcting this type of problem with the extension programme during the past two or three years.

24 Ideally, the amount of money borrowed or received would, of course, be a more discriminating indicator. Unfortunately it was not possible to collect sufficiently complete or reliable data for this.

25 ACSI = the Amhara Credit and Savings Institution.

2.3.6 Social capital

Indicator 16) Access to social support networks

Two indicators of social capital were selected from the questionnaire data. The first indicates access to informal social support networks in times of crisis, and is derived from two questions in Section F2 of the questionnaire:

- 'If your household had a problem and needed *money or food* urgently, would you be able to get it from people in your community or from relatives?' *(q.64)*, and
- 'If someone in your household fell ill or was injured, and you needed help with farming or other *work*, would you be able to get it from people in your community or from relatives?' *(q.66)*.

These questions were adapted from part of the MEDAC[26] Welfare Monitoring Survey questionnaire. The separate question on the role of social networks in providing labour (as distinct from money or food) was included because of insights into the importance of this factor gained from investigative field work during Phase I of the project and field-testing of the questionnaire. Initial exploration of the data seems to confirm that being able to call on other people for physical help is much more common, and possibly more important to many households, than asking for help in kind or cash. It might be hypothesised that this will be particularly true for elderly, single-adult households[27] and other labour-poor groups.

A household scores either 0 (=No) or 1 (=Yes) on each of the two questions[28]. The scaled indicator is then constructed as a simple average of the two, giving the three possible values shown in Table 2.12.

Table 2.12 Scaled values for indicator 16 (social support networks)

Category	Scaled value
Could get help with money/ food *and* with labour	1
Could get help *either* with money/ food *or* with labour	0.5
Could not get any kind of help in a crisis: no social network to call on	0

Indicator 17) Participation in social institutions

The second indicator of social capital registers the level of a household's participation in the social institutions of their community *(questionnaire Section F1, q.60)*. The assumption here is that people who are more socially active have a wider network of contacts and mutual obligations to call on for various types

[26] Ministry of Economic Development and Cooperation, Addis Ababa.

[27] Most, but not all, of these are female-headed households. Men living without wives are a much smaller group but can face severe labour constraints and often rely on help from female relatives.

[28] The questionnaire also asks how many people the household could call on for each type of assistance (*q.65* and *q.67*). However, during analysis it was decided to use the simpler dichotomous questions for the indicator, since the number of people could be misleading as well as difficult to interpret or scale (the range of answers was very wide). More people do not necessarily mean more help.

of support and resource access. The level of social activity in itself also reflects a household's material prosperity, social standing, and available time or labour.

The indicator simply counts the number of social institutions participated in by any member(s) of the household during the previous twelve months. In order to be comparable across the study area, and to focus on the most basic institutions which would potentially distinguish the destitute from the merely poor, responses were limited to a set of six institutions pre-defined by pilot fieldwork and secondary information. These were:

- Funeral societies (*kire* / *idir* / *debese*);
- Savings groups (*equb*);
- Church or saint's day social groups (*mahaber* / *senbete*) in Christian communities;
- *Zawiya* (prayer / coffee-drinking / social circle) in Moslem communities;
- Reciprocal or exchange work groups *(wonfel);* and
- Festive work groups (*debo* / *jigi* / *wobera*).

The expected maximum answer was five, since the Moslem and Christian institutions are, of course, cultural alternatives: no household is likely to participate in both (though some of the sampled villages did contain both religions). In practice, participation in savings groups was so rare in the sample that the data range for scaling was truncated to a maximum of four institutions. The minimum was set at the actual data minimum of zero. The resulting scaled values for the indicator are shown in Table 2.13.

Table 2.13 Scaled values for indicator 17 (social participation)

Data value (Number of institutions household members participated in during the past 12 months)		Scaled value
max (truncated)	4 +	1.00
	3	0.75
	2	0.50
	1	0.25
min (actual)	0	0.00

Preliminary analysis of the data showed that only 4.2 per cent of the sampled households scored zero on this indicator (meaning that they did not participate in any of the institutions during the past year), while a further 10 per cent only participated in one institution. It was generally observed, as expected, that if a household was only able to join one social activity it was most likely to be a funeral society. Inability to contribute to funerals is considered a sign of severe deprivation, both material and social.

Apart from inability to contribute to costs, the main reasons raised for non-participation in the various institutions were lack of time or labour; the decline of some institutions, especially labour-sharing,

because of shrinking farm sizes and general impoverishment; and age (household members may be considered either too old or too young to participate in some activities).

The very low proportion of households who reported no social participation at all corroborates the finding of the qualitative fieldwork that social exclusion is rare in these communities: even the very poorest are generally not regarded as separate or different from the rest of the community.[29]

3 Constructing a "destitution index"

3.1 Combining the indicators: alternative methods of weighting

Each of the indicators discussed above represents one piece in the complex mosaic of poor people's livelihoods in Wollo. Each indicator was explored separately during the preliminary quantitative analysis (see Devereux *et al.* 2003 or Sharp *et al.* 2003, Chapter 5): but it was anticipated from the beginning of the project that no single indicator would in fact capture the varied and multi-dimensional phenomenon of destitution, and that it would be necessary to combine the indicators into more complex indices in order to estimate how many people are destitute. This section outlines the various methodological options for constructing such composite indices.

Once the indicators are scaled (or normalised) as discussed above, it is possible to add them together without the element of distortion which would be introduced by widely differing value ranges[30]. However, the next challenge is identifying the relevant weights to give to each indicator. There are four possible approaches to this problem (White 2002b, Filmer and Pritchett 1998):

1) Assigning weights based on qualitative or subjective judgement. The option of summing or averaging "unweighted" indicators is included under this approach, since it is in effect a decision to give all the indicators equal weight.

2) Constructing a set of weights based on a common factor which can be applied to all the indicators (for example, market or shadow prices).

3) Allowing the weights to be determined mathematically, using principal components analysis (or PCA), a computerised statistical procedure (discussed below); or

4) Avoiding the need for weights by simply running a multivariate regression analysis with all the indicators as unconstrained variables.

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29 Dejene Negassa, field notes of focus group discussions on the nature and processes of destitution.

30 One technical issue which merits further consideration is the potential implicit weighting effect of combining in these indices three numerically different types of variable:

- *Continuous* variables, in which a wide range of values is possible between the minimum and maximum, and the interval between values is determined by the measurement unit used – for example, units of livestock or hectares of land;
- *Dichotomous* (Yes / No or 1 / 0) variables, such as whether or not the household received credit; and
- *Categorical* variables such as the housing quality indicator described in Section 2.3.1, which has only three possible values defined as 0, 0.5 or 1.

The second approach was rejected because no common factor was found which could meaningfully be applied to all the indicators we wished to use: shadow pricing was not considered appropriate, given the highly imperfect markets for most commodities and services in Wollo and the intrinsically non-monetary value of important factors such as social capital.

The fourth approach, multivariate regression, is statistically unsatisfactory for this purpose because the variables to be included are not independent of each other: they are expected to be highly correlated, and to have indirect effects on each other. The resulting multicollinearity would produce misleading regression coefficients. Using regression would also restrict the types of analysis that could be done with the results: for example, cross-tabulations would not be possible (White 2002b: 15).

The two remaining alternatives, qualitative weighting and PCA weighting, were explored in some detail. Each has advantages and disadvantages, and is appropriate for different purposes. The qualitative approach applies informed judgement, drawing on the contextual fieldwork and on preliminary analysis of the questionnaire data, to determine the relative importance of the various indicators in the household's overall livelihood status. It is transparent and intuitively appealing. It gives scope for either combining or separating different dimensions of the framework (e.g. the five resource categories), for different analytical purposes. It also allows the analyst to adjust the weight given to any indicator(s) at any point in the analysis. The same weights and scales could be applied to other populations with similar livelihood structures (that is, assuming the indicators themselves are relevant), and produce comparable household scores. The main disadvantage, of course, is the inherent subjectivity of the weights.

Objective weighting (using PCA) has the contrary advantages and disadvantages. Since the weights are mathematically determined there is no pre-judgement of the relative importance of variables (except, of course, in deciding which indicators to include). In fact, as discussed below, the analysis generates an objective ranking of the indicators. On the negative side, it is intuitively less easy to understand. Care must also be used if this approach is used to compare different populations. Since the weights are generated by the variance of the data set itself, they will be different for each population: therefore, the household scores may not be comparable between the two sets.

Ultimately it was the latter approach (objective mathematical weights generated by PCA) that was used to identify and count destitute households in the sample, as detailed below and in the final study report. The following section first outlines the options considered for qualitative weighting, as an example of the methodological issues involved and for comparison with the alternative "objective" index: illustrative worked examples of the scaled indicators and qualitative weights will be found in Appendix 2. It will be seen from the discussions below that some of the qualitative weighting is unfinished work in progress. Sections 3.3 and 3.4 then discuss in more detail the calculation and application of the PCA-weighted index. Both approaches use the same set of indicators defined in Section 2 above.

3.2 Using "qualitative" weighting

3.2.1 Basic needs index

The first element of our definition, the extent to which households are (un)able to meet their *minimum subsistence needs*, could be measured by a combined index of basic needs as represented in Figure 2.1 (Section 2.1. above). It is proposed to construct this as a simple average of indicators 1 to 5, reflecting household access to food, clothing, shelter, and a few basic items of recurrent cash expenditure. The simple average implicitly gives equal weight to each indicator. However, including *two* indicators of food security gives double weight to this aspect of basic needs, so that the two food security indicators together comprise 40 per cent of the index value, while the other indicators contribute 20 per cent each. This emphasis on food security is judged appropriate to the realities of poor and destitute people in the study area.

As with the individual indicators, it should be remembered that the resulting scaled index is a measure of relative poverty within a very poor population, and is designed to focus on the poorer end of the socio-economic distribution. Thus, a maximum score of 1 on this composite index of basic needs indicates merely adequate ability to meet minimum subsistence requirements (see household 4 in the worked examples in Appendix 2): it does not necessarily mean the household is well-off.

3.2.2 Livelihood resources index

The livelihood resources index is constructed in two steps: first, a composite or proxy indicator is defined for each of the five resource types in the framework (see Figure 2.1), and then these are combined in an overall resource index.

Human capital

Human capital is represented by a combined index of indicators 6 (household labour capacity), 7 (adult male labour) and 8 (access to paid non-household labour). Relative weights of 0.5, 0.25 and 0.25 respectively are provisionally proposed (based on a qualitative judgement of the relative importance of the components).

Natural capital

Indicators 9 (farmland owned) and 10 (land cultivated) are combined into an index of the natural capital dimension of livelihood resources, calculated as a simple average of the two land indicators. In effect, this calculation gives full weight to land which is owned and farmed by the household, and half weight to land which is *either* owned but not farmed, *or* farmed but not owned. This weighting is intended to approximate the effect of sharecropping (or, less commonly, renting) on the economic return to farming land as a livelihood resource.

A number of simplifying assumptions are involved. The most problematic is the implicit assumption that both parties to sharecropping (and renting) receive half as much benefit from a *timad* of land as

someone who both owns and farms the land – whereas, in reality, we know that the terms of sharecropping contracts vary widely according to location, the relative local supply of land and labour, the quality of the land, and the relationship between the two parties. Unfortunately the questionnaire data on these issues are not detailed enough to allow us to factor in the exact terms of sharecropping in each case. Rental agreements are probably even more variable, but even less is known about them (renting land was illegal under the previous government, and informants remained reluctant to discuss it). A further simplification is that the index ignores the practice of fallowing, in which a household may leave part of its land unfarmed in order to maintain its fertility. Relatively few informants reported doing this during the last season – many said that the practice had fallen into virtual disuse because of shrinking landholdings – but there are certainly some cases of fallowing among the sample which are knowingly ignored in the calculation of this index. Factors affecting the relative productivity of different plots (agro-ecological zone, slope, soil type, irrigation potential, etc.) are also, of necessity, ignored in all the land calculations. Despite these recognised limitations, the proposed index is considered useful, and more informative than either owned or cultivated land alone.

The worked examples in Appendix 2 include, for illustration, two labour-poor households that own land but cultivate none; one that owns land and cultivates more than they own; and one landless household that farms by sharecropping or renting in.

Physical capital

After preliminary analysis of the three indicators suggested for physical or economic capital (oxen ownership, access to draught power, and total livestock ownership), as discussed in Section 2.3, it was decided that total livestock ownership was the most appropriate indicator. Therefore, the physical capital index proposed here is the same as indicator 13 (total TLUs owned, scaled from 0 to 1 using a truncated maximum value of 6 TLUs).

An alternative calculation combining indicator 11 (oxen owned) with indicator 13 (total livestock) was also tested. This would deliberately give additional weight to oxen in relation to other animals. However, this was rejected because of the low percentage of households owning oxen, the complication of other animals (including bulls) being used for ploughing, and the lack of a convincing basis on which to determine the relative weighting of oxen to other livestock when using different scales.

Financial capital

Preliminary analysis of indicator 15 showed that only about 5 per cent of households reported receiving cash gifts or remittances. Rather than drop this element, however, it was decided to combine it with indicator 14 (access to credit) to give a single indicator of financial capital. Initial exploration of the data, as well as observations from the qualitative work, suggest that access to formal or informal credit is more important in the study area than gifts and remittances (which are even rarer than credit). A weight of 0.6 was therefore given to credit and 0.4 to gifts and remittances, and the two indicators were summed.

This combined indicator proved statistically more significant than either of the two components alone, and in fact was used as a variable in the principal components analysis (see below).

Social capital

A combined index of social capital could be constructed as an unweighted average of indicators 16 and 17 (access to emergency support networks, and participation in community institutions). This rather arbitrary weighting is provisionally suggested in the absence of a more nuanced basis for combining the indicators, and could be adjusted at a later stage if a better model emerges.

Combined livelihood resources index

Finally, the five dimensions of livelihood resources (human, natural, physical, financial and social capital) will be combined into an overall index of household livelihood resources. A simple (equal-weight) average of the five dimension indices is suggested, in order to reflect the partial substitutability among different capital types.

Figure 3.1 Livelihood resource indices for four example households

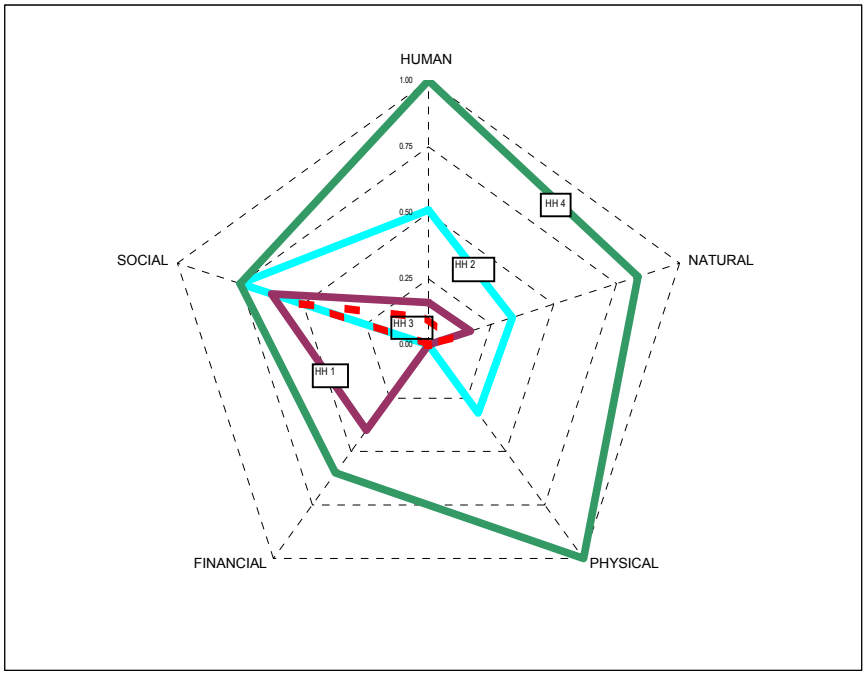

Figure 3.1 illustrates the five qualitatively-weighted livelihood resource indices, using the four example households described in Appendix 2. The *combined* resource index values are 0.27 (household 1); 0.38 (household 2); 0.14 (household 3); and 0.84 (household 4). The radial graph format visualizes how the structure of the qualitatively-weighted indices enables comparison of different dimensions within the composite resource index, and how households with similar levels of overall poverty may have very different resource profiles. A similar format could be used to compare the average levels of different

resource types across categories of households (for example, mean index values for destitute and vulnerable households could be compared with those for non-destitute and viable households).

3.3 Using "objective" (PCA) weighting [31]

In contrast to the above approach, all the component indicators in the PCA-weighted index are entered simultaneously into the analysis, which quantifies their relative contribution to the underlying variance in the data. After the first stage of analysis, 15 indicators were selected from the original seventeen: access to draught power was dropped (see Section 2.3.4), and access to gifts and remittances was combined with credit to give a single index of financial capital (see Section 3.2.2). A PC analysis was then run on these fifteen indicators, using SPSS, with the results outlined below.

Principal Components Analysis (PCA) is a type of factor analysis. It is a purely statistical procedure: it does not incorporate any econometric model of the relationship between the given variables, but simply mathematically quantifies the impact of each variable on the total variation in the data. The most common use of PCA is for data reduction: that is, to reduce the number of variables in a computation by detecting those that do not contribute significantly to the total variation. A second use, and the one adopted here, is to detect structure in the relationships between variables. We use PCA to determine the weights or scores assigned to a set of variables selected, as discussed above, to represent the various aspects of destitution (and its converse, viable livelihoods). To do this, we follow the method applied by Filmer and Pritchett (1998) to the construction of an asset index as a proxy for household wealth in India.

PCA determines the weights for a composite index by extracting from the given set of variables those linear combinations which best capture the common information (Filmer and Pritchett 1998: 6). The crucial assumption, as Filmer and Pritchett point out, is that this undefined 'common information' is in fact determined by the underlying phenomenon that the index is intended to measure ("household long-run wealth" in Filmer and Pritchett's case, "destitution" in ours). The validity of this assumption cannot be statistically verified: it depends on the correct identification of the relevant variables or indicators, and is therefore largely a matter of judgement.

The first stage of PCA extracts the "principal components" which could potentially explain the total variance. Fifteen components were extracted (equal to the number of variables), but only the first four are significant (based on the Kaiser criterion of an Eigenvalue greater than 1) [32].

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31 The description of statistical procedures in this section draws on notes provided by the quantitative analyst on the Destitution Study team, Anthony Baah. This and the following Section (3.4) are taken from Section 5.6 of the final study report (Devereux *et al.* 2003, Sharp *et al.* 2003).

32 The Eigenvalue is a measure of standardised variance with mean 0 and standard deviation 1. Each standardised variable (i.e. each of the 15 indicators in our case) contributes at least the variance of 1 to the principal components extraction. The Kaiser criterion states that unless a principal component extracts at least as much as one of the original variables (i.e. has a standardised variance equal to or greater than 1), it should be dropped from further analysis.

Table 3.1 Total variance explained (first 4 principal components)

Component	*Initial Eigenvalues*		
	Total (Eigenvalue)	**% of variance explained**	**Cumulative %**
1	4.598	30.651	30.651
2	1.872	12.478	43.129
3	1.241	8.273	51.402
4	1.034	6.896	58.298

(SPSS output table)

From these, the first component was chosen for use in constructing the index, because it explains 30.6 per cent of the total variance in the 15 indicators,[33] and gives a positive weight for all of them. This was not the case with the other three significant components, which produced negative weights for some of the variables (contrary to our understanding of the meaning of these indicators, which had been scaled in such a way that we would expect them all to have a positive weight in the overall combined index).

Table 3.2 Weights of variables under PCA

Rank by score	Variable	Score (weight)	Mean	Standard Deviation
1	**Total livestock ownership**	**0.170**	0.4001	0.32479
2	**Oxen ownership**	**0.161**	0.4295	0.40657
3	**Cultivated land**	**0.157**	0.5166	0.33732
4	**Household labour capacity**	**0.144**	0.5154	0.21931
5	**Participation in social institutions**	**0.144**	0.6611	0.27696
6	**Male labour**	**0.133**	0.7908	0.40684
7	**Access to non-household labour**	**0.122**	0.3963	0.48925
8	**Basic expenditure**	**0.112**	0.6688	0.33401
9	**Meals per day**	**0.106**	0.6315	0.33239
10	**Months of food shortage**	**0.100**	0.6654	0.30090
11	**Clothing purchases**	**0.100**	0.6863	0.32868
12	**Farmland owned**	**0.096**	0.5016	0.29231
13	**Housing quality**	**0.091**	0.6406	0.41461
14	**Access to social support networks**	**0.050**	0.5941	0.35393
15	**Financial capital (credit +/or gifts)**	**0.026**	0.1559	0.26333

Source: SPSS output table (ranked)

[33] In Filmer and Pritchett (1998: 11), the first principal component explains 25.6 per cent of the variation in the 21 asset variables used.

One of the advantages of PCA (apart from the objectivity of the weights) is that it estimates the contribution of each variable to the underlying 'common information', and thus enables us to rank the indicators according to their importance in determining a household's level of destitution (defined as their score on this overall index). The weights (or scores) assigned to the indicators on the first principal component are shown in Table 3.2.

These results were then used to construct the overall "destitution index", applying the following formula (after Filmer and Pritchett 1998: 6):

$$D_j = \sum_{i=1}^{k} [w_i (a_{ji} - m_i)] / s_i$$

where: D_j is a standardised index (which we will call the 'destitution index') for household j;
w_i represents the weights (scores) assigned to the (k=15) variables on the first principal component;
a_{ji} represents the observation for the j^{th} household on the i^{th} variable;
m_i is the mean of the i^{th} variable; and
s_i is the standard deviation of the i^{th} variable.

Finally, the results were scaled (or normalised) by converting them from interval data to ratio data (adding the lowest household value to all household values to give a starting point of zero, and then dividing by the highest household value to scale the final index from 0 to 1). All households in the sample were then ranked according to their score on this combined standardised index (D_j). Households ranking lowest on the index (nearest to zero) are the most destitute according to this combination of indicators.

3.4 Setting a cut-off: triangulating the PCA-weighted index

The problem with a continuous indicator such as this derived Destitution Index is that it does not contain within it any principle or rule for isolating destitute households from the rest. A household's score on the index has no easily explained meaning in itself, since it is a mathematical composite of fifteen different factors. In order to estimate the number of destitute households, therefore, it is necessary to determine a cut-off point between "destitute" and "non-destitute" households[34].

Three approaches to setting a cut-off point were considered:

- Arbitrarily designating a percentile cut-off, based on common practice in poverty analysis, secondary information, or judgement;
- Selecting one (or more) of the indicators already included in the index as the key characteristic of destitution, and then examining its overlap with the index to determine the proportion of households classed as "destitute". Intuitively, the strongest candidate for such a touchstone in the case of Wollo would be one or more indicators of food insecurity.

[34] This need for a "cut-off" value or "destitution line" would apply equally to a qualitatively-weighted index. It is discussed here in relation to the PCA-weighted index since this is the method actually applied in the Destitution Study.

- Triangulating the overall Destitution Index, which is composed of quantifiable indicators of household resources and welfare, with a more subjective and holistic assessment of each household's livelihood situation.

The first option, which is commonly used in poverty analysis, is simply to designate an arbitrary percentage of the distribution (for example, the lowest 40 per cent, or 20 per cent) as the poorest (or in this case, the "destitute"). Filmer and Pritchett, for example, categorise the bottom 40 per cent (or four deciles) of the population on their asset index as 'poor'. For their purpose, this is convenient and appropriate (and they are careful to point out that this arbitrary percentage does not equate to an income-based poverty line). For the Destitution Study, however, such an arbitrary division was not considered satisfactory, since the key research questions included *defining* destitution and estimating its scale. There are no readily available and widely-accepted measures of destitution, as there are of income poverty, against which such a cut-off could be justified.

A modification of the approach just described would be to determine a cut-off percentage based on prior or secondary information (such as Save the Children's Household Food Economy assessments), or on qualitative results from the Destitution Study fieldwork (such as the proportion of households placed in the poorest category during wealth-ranking discussions). However, these estimates were considered too relative and too locally-variable across the study area to be valid for this purpose.

The second approach, of identifying a "touchstone" or defining indicator among those included in the Destitution Index, was explored through an analysis of each indicator's distribution and the overlaps among them. As part of this analysis, threshold values were identified which could potentially identify the poorest or "destitute" households in terms of each individual indicator. These thresholds were determined by a combination of information from the qualitative fieldwork (especially descriptions by wealth-ranking discussants and focus groups of the resources and characteristics of the destitute), and the distribution curve of the quantitative variable in the household data. In most cases, there was a discontinuity in the distribution which matched quite well with the qualitatively-judged threshold. Table 3.3 summarises the thresholds, and the percentage of households which fell below them, for those indicators which showed potential for distinguishing the poorest from other households.

These thresholds and percentages were not, in the end, used to identify the cut-off value for destitution on the overall index. Exploratory analysis showed that, although the percentages of poorest households on different indicators were in some cases close, it was not necessarily the same households that fell below the different thresholds: the overlaps were far from 100 per cent. This analysis was useful, however, as it reinforced the view that destitution is too complex, various, and multidimensional to be identified by a single proxy indicator. At the same time, the high percentages and very low thresholds of basic needs and resources shown in the table above are a salutary reminder of the depth of poverty among the study population as a whole.

Table 3.3 Possible thresholds for destitution in individual indicators

Category	Indicator	Cut-off point for 'destitution'	'Destitute' by this indicator
Basic needs	Meals per day	1 or 0 meals/day in worst month last year	29.2%
	Months of food shortage	> 3 months food shortage last year	19.2%
	Clothing purchases	1 or 0 times in last three years	23.2%
	Housing quality	Poor quality of both roof and walls	24.3%
	Basic expenditure items	No basic items present in the home	10.6%
Livelihood resources	Household labour capacity	< 2 adult equivalents in the household	19.0%
	Male adult labour	No adult male labour in the household	20.9%
	Land owned	< 2 *timad* (0.5 ha) of farmland owned	22.0%
		or landless	7.0%
	Land cultivated	< 2 *timad* (0.5 ha) of land cultivated	26.2%
		or no land cultivated	12.8%
	Livestock ownership	No livestock owned	18.4%
	Social capital	No social support networks to offer help	17.4%
		Participation in 0 or 1 social institution	14.6%
		Mean of percentages	*18.9 %*

The third approach – triangulating the Destitution Index with an independent indicator – was the one finally adopted. The indicator used was the household's overall assessment of their current (2001/02) situation on a given scale of livelihood viability (see Section H of the questionnaire, in Appendix 1). The bottom category on this scale, which we have taken as equivalent to "destitute", was described as: 'unable to meet household needs by your own efforts; dependent on support from the community or government[35] (could not survive without it)'. The emphasis in this description on the household's reliance on others matched well with local perceptions of the social and psychological dimensions of destitution (loss of pride and independence), as well as with the third element of our working definition (dependence on transfers). 14.6 per cent of the 2,127 sampled households placed themselves in this category.

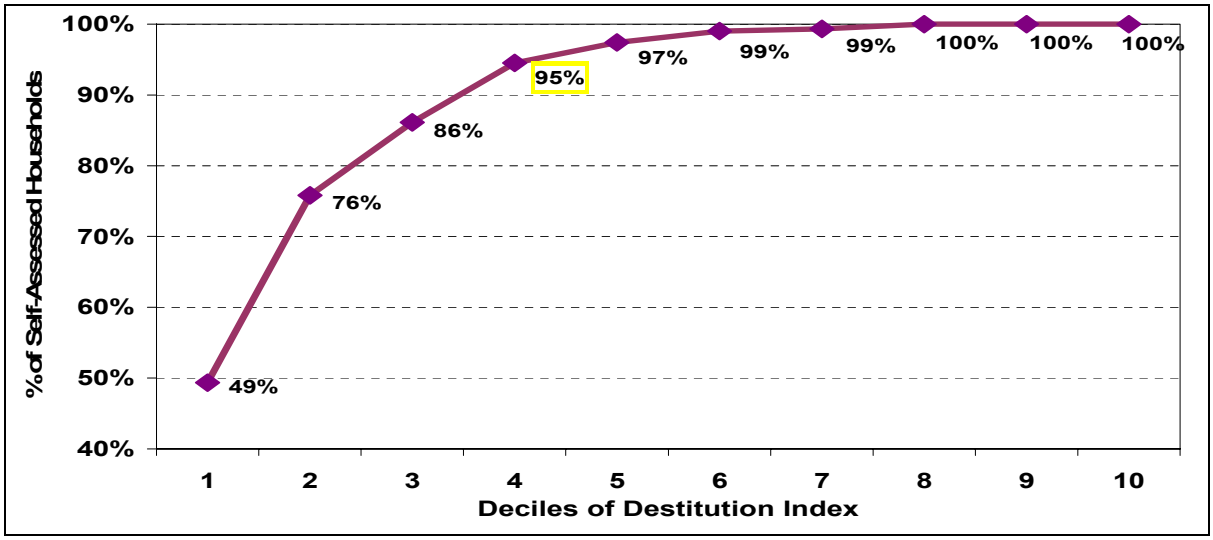
Comparing the overall Destitution Index with this self-assessment indicator, Table 3.4 and Figure 3.2 show a very strong correlation between the two measures. If the match were perfect, the 310 households that reported they were 'unable to meet basic needs' would also score lowest on the composite index and be ranked as the bottom 310 households in the sample, in terms of the Destitution Index: however, this is statistically so unlikely that it would call into question the reliability of the data. In fact, the degree of overlap between these two indicators is just under two-thirds: 201 of the 310 households (64.8 per cent) fell in the bottom 14.6 per cent of the full sample, in terms of the composite index.

[35] The term "government" in local usage includes NGOs, UN and donor organisations.

Table 3.4 Self-assessed destitute compared to objective destitution index

Composite Index / Self-Assessed	In bottom 14.6%	In bottom 20%	In bottom 30%	In bottom 40%	In bottom 50%	In bottom 60%	In total sample
Unable to meet basic needs without support (number of hhs)	201	235	267	293	302	307	310
Estimate of destitution by this intersect (% of hhs, n=2127)	9.5%	11.0%	12.6%	13.8%	14.2%	14.4%	14.6%
Coverage of self-assessed destitute	64.8%	75.8%	86.1%	94.5%	97.4%	99.0%	100%
P-value	*p<0.01*	*p<0.01*	*p<0.01*	*p<0.01*	*p<0.01*	*p<0.01*	*p<0.01*

Figure 3.2 Self-assessed destitute compared to objective destitution index



The robustness of these two indicators in relation to each other can be seen in the proportion of self-assessed destitute captured as the percentile threshold on the Destitution Index is raised (reading the table from left to right). Fully 76 per cent of the self-assessed destitute fall in the bottom 20 per cent of the destitution index, and 95 per cent fall in the bottom 40 per cent. This suggests that there is a strong correlation between the two indicators. A chi-square test (χ^2) of association between the two groups – households in the bottom 14.6 per cent, 20 per cent, 30 per cent, 40 per cent and 50 per cent of the overall index, and the 310 (14.6 per cent) self-assessed destitute households – confirms this hypothesis.

The chi-square test shows a significant association between the two groups at the 1 per cent level (p-value <0.01 in all the cases from 14.6 per cent to 50 per cent).[36]

We therefore conclude that the two approaches – self-assessment by respondents of their current livelihood status, and the composite Destitution Index derived from 15 objective indicators of resources and welfare using Principal Components Analysis – are internally robust and consistent with each other. In order to combine them, one option would be to apply the rule that only those households unable to meet their basic needs without transfers *and* ranked in the lowest 14.6 per cent on the Destitution Index will be counted as actually destitute. This rule gives an estimate of the destitute as 9.5 per cent of the population: however, this would be an extremely strict criterion. In the end, the following slightly more flexible definition of the overlap was adopted for the final classification of destitute households:

> Destitute households are those that self-reported they were dependent on transfers to meet basic household needs *and* are ranked in the lowest 40 per cent in terms of the Destitution Index.

This is in keeping with standard practice in economics of taking the bottom 40 per cent of households in an income distribution as the "poorest", and at the same time helps to eliminate potential errors or misreporting by wealthier households of their true livelihood status. In fact, only 17 of the 310 self-assessed destitute households are eliminated by applying this rule, reducing the percentage of "destitute" households from 14.6 per cent (measured by self-assessment only) to 13.8 per cent (measured by a combination of self-assessment and the composite index).

4 Conclusions

In the specific context of Wollo, and of the Destitution Study, this paper has aimed to document in some detail the analytical decisions and procedures behind the quantitative estimates of destitution given in the final study report and presented to policy-makers in Ethiopia. The analytical framework and methodology could be replicated in other parts of Ethiopia (or elsewhere), although in this case care should be taken to ensure that the indicators selected, and the threshold values used for scaling them, are appropriate to the local context. The specific PCA-derived weights applied in this analysis could only be used in another context if the livelihood systems, and the levels of resources and welfare outcomes among the population as a whole, were very similar to those in Wollo. If this were not the case, then a separate PCA analysis would need to be applied to the local data to generate the necessary statistics (standard deviations, means,

[36] If the p-value (exact significance) of the chi-square was > 0.05, the hypothesis of a significant association between the groups would be rejected.

and scores) to calculate the "destitution index" for that specific population. In this case, the index would be valid for that area and population, but the index values would not be directly comparable between the two different populations.[37]

At a more general methodological level, the paper also provides an applied example of the synergy between qualitative information and quantitative measurement, in the analysis of household survey data. In particular, it has illustrated the importance of using qualitative data to inform and enrich quantitative analysis. Many of the essential judgements made in the course of the analysis described here, regarding the selection, interpretation and scaling of indicators, would have been impossible without the insights and contextualisation produced by the simultaneous qualitative fieldwork.

Among the specific methodological innovations arising from this work, the triangulation of objective indicators obtained through standard quantitative enumeration techniques with a more holistic, "subjective", "participatory"[38] self-assessment of household status is particularly interesting. It represents a further step in combining "qualitative" and "quantitative" data types to provide a more balanced analysis of a multidimensional reality. The very close correlation of results from the two methods validates their compatibility, and tends to confirm the accuracy of our conclusions. The collection of such "qualitative" data from a random household sample, so that they can be statistically related to objective indicators, is unusual.

The exploration of "qualitative" versus "objective" methods of weighting composite indices also raises some issues of general interest. Ultimately, each method has advantages and disadvantages. For the Destitution Study, it was decided to use a statistical weighting technique for its greater objectivity: however, the transparency and flexibility of weighting by informed judgement (that is, applying "qualitative" data) may be more appropriate to other purposes. Both approaches are valid.

The household labour capacity index developed for this research to take account of people's health status and actual physical capabilities, and its application in alternative calculations of "real" dependency ratios (see Appendix 3), are potentially of wide use. Although the exact format of the labour capacity index used in the Destitution Study relies on collecting specific data for the purpose, an adaptation of it could be developed for any data set which contains variables on age and health status (ideally combined with adequate local contextual data). The invisibility of chronic illness and disability in standard measurements of dependency and human capital is a serious distortion, one which has recently been highlighted in the context of the HIV/AIDS pandemic but which is also of importance in poor populations ravaged by other major illnesses and disability.

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37 For example, a household scoring 0.25 on the Wollo destitution index, and another household scoring 0.25 on an index constructed in the same way from a different data set, would not necessarily have the same level of resources or welfare. Note that the differences in resource or welfare levels, even if the same indicators are used, are invisible once the index is scaled from 0 to 1.

38 The term "participatory" is used here in the delimited sense that the informants participate in the analysis of their situation, rather than simply supplying discrete pieces of information which are then combined and interpreted by researchers.

Finally, the analysis reported here is also a contribution to the growing empirical literature on operationalising and quantifying the livelihoods framework. It has focused on quantifying assets, access and outcomes at the household level. Among the general issues raised are the rather fluid nature of some resource categories in the framework, and the need for locally meaningful interpretations of them. This makes for flexibility, but also for limitations on the scope for standardisation or comparison across livelihood systems.

Appendix 1 Extracts from the household questionnaire

Note: this Appendix contains only those sections of the questionnaire directly relevant to the indicators discussed in this paper, as listed in the table below. The full questionnaire can be found in Sharp *et al.* 2003, Annex 2.

Table A1 List of indicators and corresponding questionnaire sections

Dimension	*Indicators*	**Questionnaire Section: question No.**
FOOD SECURITY	1. Number of meals per day during worst month of last year	G.1: Q 82
	2. Months of food shortage during last year	G.1: Q 83
OTHER BASIC NEEDS	3. Clothing: number of times purchased during the last 3 years	G.3: Q 87
	4. Housing: adequate or inadequate protection from the weather	G.4: Q 90 & 92
	5. Basic expenditure items	G.5: Q 93 to 96
HUMAN CAPITAL	6. Household labour capacity	A.1: Q 7
	7. Male adult labour	A.1: Q 6 & 7
	8. Access to non-household labour	D.1: Q 33
NATURAL CAPITAL	9. Land owned	D.2: Q 35
	10. Land cultivated	D.3: Q 37
PHYSICAL CAPITAL	11. Oxen owned	D.5: Q 43
	12. Access to draught animals	D.4: Q 39
	13. Total livestock owned	D.5: Q 43
FINANCIAL CAPITAL	14. Access to cash credit	E.1: Q 52 & 57; F.3: Q 69
	15. Access to cash gifts or remittances	F.3: Q 69; B.2: Q 19
SOCIAL CAPITAL	16. Access to social support networks	F.1: Q 64 & 66
	17. Participation in social institutions	F.1: Q 60

A.1. HOUSEHOLD PROFILE

Line No.	Relationship to household head *(write code)*	Participating in interview? *(circle one)*	Age *(write age in completed years)*	Male/ Female *(circle one)*	Labour capacity *(write code)*
(2)	(3)	(4)	(5)	(6)	(7)
01	0 1				
02					
etc.					

Codes: Relationship to household head

01 = household head
02 = wife
03 = son / daughter of head or wife
04 = son-in-law / daughter-in-law of head or wife
05 = grandson / granddaughter of head or wife
06 = father / mother of head or wife
07 = brother / sister of head / wife
08 = other relative of head/ wife
09 = adopted
10 = non-relative / servant

Codes: Labour capacity

1 = child (too young to work)
2 = working child (herding livestock; doing domestic chores; childcare; may be hired / fostered out)
3 = "adult assistant" (boys helping in fields, girls making *wot*)
4 = adult (able to do full adult workload)
5 = elderly (not able to do full adult workload)
6 = permanently disabled (unable to work)
7 = chronically ill (unable to work for past 3 months or more)

B.2. INCOME PROPORTIONS

In addition to the income sources listed in B1, did the household receive any free food aid in the past 12 months? Any free cash (formal/ official relief)? Any other (informal) gifts of cash or food? Any remittances from people living somewhere else?

(Proportional piling – see full questionnaire and field manual for detailed instructions).

Activity / income source		Income proportion *(write number of beans)*
Code *(copy from B1)*	*(if no code – write name)*	
(19)	(20)	(21)
FA	Free food aid (includes general rations and faffa)	
FC	Free cash (for relief)	
GI	Gifts (cash or food, apart from official aid)	
RE	Remittances (from people living somewhere else)	
etc.		
	check TOTAL =	1 0 0

D.1. ACCESS TO LABOUR

(33). During the past 12 months, who did the work of crop farming, livestock care, domestic work and other types of work for your household? Which of these types of labour did your household employ *(read codes)*?

Activity	**Sources of labour this year (last 12 months)** *(circle as many as apply)*
Crop farming	0 1 2 3 4 5 6 7 8
Livestock	0 1 2 3 4 5 6 7 8
Domestic work	0 1 2 3 4 5 6 7 8
Other types of work	0 1 2 3 4 5 6 7 8

Codes: Sources of labour

0 = household not doing this type of work
1 = household labour
2 = other relatives or friends (unpaid)
3 = share-cropper
4 = daily hired local labour
5 = long-term hired local labour
6 = hired migrant labour (from outside the wereda)
7 = reciprocal / exchange work parties (e.g. *wonfel*)
8 = festive work parties (e.g. *jigi, debo, wobera*)

D.2 LAND-HOLDING / LANDLESSNESS

(35). How many *timads / ……* of **farming land** does your household own now, in total? (include landholdings of all household members; include fallow land).
(write number)

D.3 ACCESS TO FARMING LAND

(37). During the last agricultural season, how many *timads / ……..* of land did your household **cultivate**? (include sharecropped/ rented / mortgaged land)
(write number, or 0 if not farming)

D.4 ACCESS TO DRAUGHT POWER FOR PLOUGHING

Ploughed with animals – what type? *(circle as many as apply)*
(39)
1 2 3 4 5 6

Codes: Animals

1 = Ox(en)
2 = Horse(s)
3 = Mule(s)
4 = Cow(s)
5 = Donkey(s)
6 = Camel(s)

D.5. LIVESTOCK HOLDINGS & ACCESS

Livestock	Number owned at New Year 1994 (EC) *(write number, or 00 if none)*	Livestock owned now but cared for by other households *(circle one)*	Livestock cared for now by this household, but owned by someone else *(circle one)*
	(43)	(44)	(45)
Chickens	☐☐		
Sheep	☐☐	Yes No 1 2	Yes No 1 2
Goats	☐☐	1 2	1 2
Plough oxen	☐☐	1 2	1 2
etc			

E.1 CASH CREDIT

In the last year (12 months), has any member of your household borrowed any money from the following sources?: *(read column 51, circle Yes / No code in column 52).*

Source	Received credit? *(circle one)*		Repayment status *(circle one)*
(51)	(52)		(57)
ACSI	Yes No 1 2		1 2 3 4
Other government body	1 2		1 2 3 4
Trader	1 2		1 2 3 4
Other private individual	1 2		1 2 3 4
NGO	1 2		1 2 3 4
Other	1 2		1 2 3 4
			Codes: Repayment status 1 = fully repaid 2 = partly repaid 3 = not yet due 4 = can't pay (defaulted)

F.1 SOCIAL INSTITUTIONS

During the last 12 months, has anyone from your household participated in the following social institutions or activities?

Institution	**Participated this year?** *(circle one)*
(59)	(60)
	Yes No
Funeral societies *(e.g. kire / idir)*	1 2
Savings groups *(e.g. equb)*	1 2
Church or saint's day social groups *(e.g. mahaber / senbete)*	1 2
Zawiya *(coffee-drinking / social circle in Moslem communities)*	1 2
Reciprocal or exchange work groups *(e.g. wonfel)*	1 2
Festive work groups *(e.g. debo, jigi, wobera)*	1 2

F.2 ACCESS TO SUPPORT NETWORKS

(64). If your household had a problem and needed money or food urgently, would you be able to get it from people in your community or from relatives? *(circle one)*

Yes 1	No 2

(66). If someone in your household fell ill or was injured, and you needed help with farming or other work, would you be able to get it from people in your community or from relatives? *(circle one)*

Yes 1	No 2

F.3 INFORMAL TRANSFERS

In the last 12 months (between now and the same month last year), has your household **<u>received</u>** any of the following types of assistance from anyone outside the household?

(68)	(69)
	Yes No
Cash gift	1 2
Cash loan (no interest)	1 2
Food or grain gift	1 2
Grain loan (no interest)	1 2
Seed gift	1 2
Seed loan	1 2
Free labour	1 2
Free use of oxen or plough	1 2
Free use of donkey / mule / horse	1 2
Other	1 2

G.1 FOOD SECURITY / ACCESS

(82). During the worst month of the last rainy season, how many times a day did the adults and children in your household eat?

	Number of meals per day *(circle one for each row)*
Adults	0 1 2 3 4
Children *(= school-age / working children, not infants)*	0 1 2 3 4
Code: 0 = sometimes passed a whole day without eating anything	

(83). For your household, how many months did the food shortage last? *(write number of months)* | | |

G.3 CLOTHING

During the past 3 years, how many times has your household bought clothes for adults and for children?

	Number of times purchased clothing *(circle one for each row)*				
(87) **For adults**	0	1	2	3	4 or more
(88) **For children**	0	1	2	3	4 or more

G.4 HOUSING QUALITY

ROOF			**WALLS**	
Condition ***(circle one)***			**Condition** ***(circle one)***	
(90)			(92)	
Good / adequate condition	1		Good / adequate condition	1
Poor condition – inadequate protection from weather	2		Poor condition – inadequate protection from weather	2

G.5 BASIC HOUSEHOLD ITEMS

Do you have the following items in your house now?

	Yes	No
(93) Salt	1	2
(94) Coffee (*buna*)	1	2
(95) J*emfel* (coffee husks)	1	2
(96) Kerosene	1	2

H.1 SELF-ASSESSMENT OF HOUSEHOLD SITUATION

Finally, considering all the questions discussed in this interview, how would you describe the situation of your household now?

Are you able to meet your household needs by your own efforts?

Are you making any extra for stores, savings or investments (e.g. buying livestock or other assets, improving your land)?

Do you sometimes need help from your community, or from government or other agencies?

Are you dependent on this help? (Could you survive without it?)

Interviewer: *after asking these questions, choose the category in column 97 that best fits the respondents' answers.*

Then say, 'So would you agree that at this time your household is …… *(read category description)*?'

If they do not agree, discuss further and identify the category they agree with.

When they agree, circle the corresponding code for 'Now' (column 98).

Then ask, 'At the same time (same month) last year, was your household situation better, the same, or worse?'

Repeat the questions if necessary, read the category that best fits the respondents' description of their situation a year ago, and when they agree circle the code in column 99.

Repeat for 2 years ago (column 100) and 10 years ago (column 101).

Categories	**Now** *(circle one)*	**The same time last year (1993 EC)** *(circle one)*	**The same time 2 years ago (1992 EC)** *(circle one)*	**10 years ago (1984 EC)** *at change of government from Derg to EPRDF* *(circle one)*
(97)	(98)	(99)	(100)	(101)
Household not formed at that time		0	0	0
DOING WELL – able to meet household needs by your own efforts, and <u>making some extra</u> for stores, savings and investments (e.g. buying livestock or other assets, improving farmland, improving housing etc)	1	1	1	1
DOING JUST OKAY - able to meet household needs but with <u>nothing extra</u> to save or invest	2	2	2	2
STRUGGLING – managing to meet household needs, but by <u>depleting productive assets</u> and / or sometimes receiving support from community or government	3	3	3	3
UNABLE TO MEET HOUSEHOLD NEEDS – <u>dependent on support</u> from community or government	4	4	4	4

Appendix 2 Worked examples

The following examples illustrate how the indicators and the qualitatively-weighted indices would be calculated for four different households. These are realistic but invented cases, based on households encountered during the qualitative fieldwork and questionnaire survey.

Household 1 is an elderly couple with one young relative (an "adult assistant" on the labour capacity scale) living with them. The head and his wife are in poor health, so they cannot farm their 2 *timads* of land. Instead, they sharecrop it out. The wife keeps a few chickens, but they have no other livestock. They have received no cash loans from any source in the past year, but they have received occasional gifts of cash or food from their adult children living elsewhere. Age and poverty have limited their participation in social institutions: now they only take part in funerals (through the *idir*), and do not join any other community activities (such as saint's day festivals or reciprocal work-groups). They have no access to non-household labour, except when someone helps them for free. As for social support networks, they do have friends and relatives they can call on for help with food, money or labour in a crisis.

At the worst time of the last hungry season, they ate only once a day. The food shortage in their household lasted for 4 months. They have bought clothes only once in the last three years. Their house is in poor condition, and neither the roof nor the walls provide adequate protection from the weather. At the time of the survey, they had salt in the house but no other "basic commodities".

.....

Household 2 is a young family comprising husband, wife and two young children (aged 6 and 8, so old enough to work). They have no land, but are managing to farm 4 *timads* by sharecropping in. Both adults are strong and healthy, and the household is able to access enough labour for their farm by participating in reciprocal workgroups *(wonfel)*, and by pairing with neighbours for ploughing *(mekenajo)*. They are working hard to accumulate livestock, and so far they have five sheep, one young ox, and a donkey which they can use for trading or hire out to other people. The children's labour is important in enabling them to keep livestock. The household has received no credit or cash gifts in the past year. They would not expect anyone to help them with free labour since they are young and able-bodied, but they could probably ask relatives for food or money in an emergency. The young couple are socially active, participating in all community activities in their village.

During the last hungry season the household was short of food for 6 months, but they managed to eat something twice a day even at the worst time. They have bought clothing twice in the last three years. They have managed to maintain their thatched roof, but the walls of their house are thinly built and draughty. They had coffee and salt in their house at the time of the survey, but no kerosene.

.....

Household 3 is a divorced woman living alone with her small daughter (who is too young to work). After divorcing her husband she has come back to her parents' village, so she is able to receive some help from her family. She has one *timad* of land in her husband's village, which he farms for her on a sharecropping

basis to help support their daughter. She has no livestock: she has tried to share-rear a calf *(yerbee)* but did not have the labour to care for it and returned it to the owner. She cannot afford to hire any extra labour. She has received no credit or cash gifts in the last year (she would like to trade but has no capital and is scared of debt). She has not participated in any social institutions in the village during the past year, due to lack of time and labour as well as inability to contribute anything in cash or kind. In a crisis, she could ask her family for help with food or labour, although they cannot support her on a regular basis.

During the last hungry season she sometimes went a whole day without eating, and she says she is short of food all year. She has bought no clothing during the last three years (though she has been given some by her mother). Her house is relatively new and in good condition. At the time of the survey she had none of the "basic expenditure items" at home.

.....

Household 4 is a well-established and successful family, comprising four able-bodied adults (two of them male), an elderly relative, and three working-age children. They sometimes hire in local people on a daily basis (during the weeding season, for example), or throw a festive work party *(debo)* if they need extra hands for big jobs such as house-building. They own 4 *timads* of land, but because they have plenty of labour and own two oxen they are cultivating 7 *timads*. In addition to the oxen they own a flock of fifteen goats, two cows, a calf and a heifer. They also have a donkey which the adult son uses for trading. The household has borrowed cash from formal and informal sources during the past year, but has received no gifts. They participate in all the social institutions of their village. They would not expect any free help from their neighbours in a crisis because they are comparatively well-off and self-sufficient, but they have relatives in another village who they could ask for money or food if they needed it urgently.

They suffered no shortage of food last year, and were able to eat three times a day even during the worst month of the rainy season. Their house is solidly built and well-maintained. They have bought clothes more than three times in the last three years. At the time of the survey they had salt, coffee and kerosene in the house.

.....

Table A2 takes Household 2 as an example to show details of the calculations. Table A3 then compares the scaled indices for the four households described above.

Table A2 Calculation of indices for Household 2

Indicators	Unit conversion	Data value	Calculation	Scaled indices
Meals per day		2.00	(2-0.5)/(3-0.5) =	**0.60**
Months of food shortage		6.00	(6-6)/(12-6) =	**0.00**
Clothing purchases		2.00	(2-0)/(3-0) =	**0.67**
Housing quality		Good+Poor	(1+0)/2 =	**0.50**
Basic expenditure items		2.00	(2-0)/(3-0) =	**0.67**
		BASIC NEEDS INDEX	***AVG (0.6,0,0.67,0.5,0.67) =***	***0.49***
Household labour capacity	(2*1)+(2*0.3) =	2.60	(2.6-0)/(5-0) =	**0.52**
Male adult labour		Yes		**1.00**
Access to non-h.hold labour		No		**0.00**
HUMAN CAPITAL			**(0.5*0.52)+(0.25*1)+(0.25*0) =**	**0.51**
Land owned (timads)		0.00		**0.00**
Land cultivated (timads)		4.00	(4-0)/(6-0) =	**0.67**
NATURAL CAPITAL			**AVG (0,0.67) =**	**0.33**
Oxen owned		1.00	(1-0)/(2-0) =	**0.50**
Total livestock owned (TLUs)	(5*0.09)+(1*1.1)+(1*0.36) =	1.91	(1.91-0)/(6-0) =	**0.32**
PHYSICAL CAPITAL			**indicator 13 =**	**0.32**
Access to cash credit		No		**0.00**
Cash gifts or remittances		No		**0.00**
FINANCIAL CAPITAL			**(.6*0)+(.4*0) =**	**0.00**
Social support networks		Yes+No	AVERAGE(1,0) =	**0.50**
Number of social institutions		5.00	(4-0)/(4-0) =	**1.00**
SOCIAL CAPITAL			**AVERAGE(0.5,1) =**	**0.75**
		LIVELIHOOD RESOURCES INDEX	***AVG (0.51,0.33,0.32,0,0.75) =***	***0.38***

Table A3 Comparison of indices for four example households

Indicators	Household 1	Household 2	Household 3	Household 4
Meals per day	0.20	0.60	0.00	1.00
Months of food shortage	0.33	0.00	0.00	1.00
Clothing purchases	0.33	0.67	0.00	1.00
Housing quality	0.00	0.50	1.00	1.00
Basic expenditure items	0.33	0.67	0.00	1.00
BASIC NEEDS INDEX	***0.24***	***0.49***	***0.20***	***1.00***
Household labour capacity	0.10	0.52	0.20	1.00
Male adult labour	0.00	1.00	0.00	1.00
Access to non-household labour	0.00	0.00	0.00	1.00
HUMAN CAPITAL	**0.16**	**0.51**	**0.10**	**1.00**
Land owned (timads)	0.33	0.00	0.17	0.67
Land cultivated (timads)	0.00	0.67	0.00	1.00
NATURAL CAPITAL	**0.17**	**0.33**	**0.08**	**0.84**
Oxen owned	0.00	0.50	0.00	1.00
Total livestock owned (TLUs)	0.00	0.32	0.00	1.00
PHYSICAL CAPITAL	**0.00**	**0.32**	**0.00**	**1.00**
Access to cash credit	0.00	0.00	0.00	1.00
Cash gifts or remittances	1.00	0.00	0.00	0.00
FINANCIAL CAPITAL	**0.40**	**0.00**	**0.00**	**0.60**
Access to social support networks	1.00	0.50	1.00	0.50
Number of social institutions	0.25	1.00	0.00	1.00
SOCIAL CAPITAL	**0.63**	**0.75**	**0.50**	**0.75**
LIVELIHOOD RESOURCES INDEX	***0.27***	***0.38***	***0.14***	***0.84***

Appendix 3 A note on "real" dependency ratios

Limitations of standard age-based dependency ratios

The standard formula for calculating the dependency ratio of a household or population is simply the number of individuals below or above 'working age' (who are assumed to be dependent), divided by the number of "working age" people (who are assumed to be productive). Youth dependency (usually calculated as the ratio of children aged 15 or below, to working-age adults between 16 and 59) is generally the main dependency burden in poor developing countries. Age dependency (the ratio of people over retirement age to the working-age population) is the major burden in industrialised countries.

Such calculations are appropriate in economies where people start and stop work at fairly standardised ages, and where there are also likely to be universal child education and old-age pensions for the "dependent" age groups. Their limitations in contexts like rural Wollo are the same as those raised in the discussion of the labour capacity index in Section 2.3.2 of this paper: (a) it is impossible to set meaningful and realistic "working" and "non-working" age thresholds, since almost all age-groups work according to their capacity: and (b) taking age as the only determinant of "working" status ignores chronic illness and disability.

The impact of chronic illness on the dependency balance both at household and national levels, and its invisibility in the standard age-based ratios, has recently been a subject of debate in the context of HIV-AIDS. For example, Shell (2000: 17) comments that the aged-based dependency ratio 'surprisingly, falls steadily under the curious demographic regime of AIDS . . . [because] dependent children are being removed [by death] simultaneously with their productive parents'. However, he continues, '[i]f adult PLWAs [people living with AIDS] are reclassified as dependents – as would seem to make more sense – then the dependency ratio will rise dramatically'. De Waal and Whiteside (2003: 1235) also stress the importance, in the face of HIV-AIDS, of using an 'effective dependency ratio, which captures the effects of the inclusion of sick adults in the denominator rather than the numerator of the dependency ratio'.

In rural Ethiopia, although the worst impacts of HIV-AIDS are yet to come, disability and chronic illness (including malaria and TB) are very common. Ignoring them in the estimation of dependency ratios is a significant distortion. Drawing on the Destitution Study analysis, two innovative alternative methods of calculating "real" or effective household dependency ratios, taking account of people's actual working or dependent status, are proposed here. The first is simply the household labour capacity (calculated as explained in Section 2.3.2) relative to the crude household size (the number of household members). The second, more developed, method adjusts for household composition on both sides of the ratio, by comparing actual labour capacity with basic consumption needs (using an adult equivalent scale of relative calorie requirements, as explained below).

Alternative 1: Labour capacity to size of household

The first suggested alternative calculation for a "real" dependency ratio, and the one applied in the Destitution Study, simply compares the household's actual labour capacity (L, derived as explained in Section 2.3.2 above to take account of physical capacity, disability and chronic illness) with the household size (S). The formula is $(S\text{-}L) / L$.

Table A4 below shows the results of this calculation, for destitute and non-destitute households in our study sample. (Note that the ratios are calculated at household level for the whole sample, not from the mean household size and labour capacity, which are shown for comparison). The study finds that destitute households are significantly smaller than non-destitute (see Devereux *et al.* 2003, Section 7.3): not surprisingly, the standard age-based dependency ratio produces a higher average value (1.1) for the larger, non-destitute households and a lower value (1.03) for the smaller, destitute households. However, the alternative calculation of a 'real' dependency ratio shows the opposite: destitute households, despite being smaller than the non-destitute, have a *higher* dependency ratio when actual labour capacity is taken into account. This finding underlines the fact that it is not simply the number and age of people in the household that counts, but their actual ability to work.

Table A4 Adjusted dependency ratio for destitute and non-destitute households

Indicator	**Measurement unit**	*Destitute* ***[n=293]***	*Non-destitute* ***[n=1,834]***	*Total Sample* ***[N=2,127]***
Household size	Number of individuals [mean] (*S*)	3.00	4.80	4.60
Household labour capacity	Adult equivalents [mean] (*L*)	1.56	2.74	2.58
Standard age-based dependency ratio ('working age' = 15-65)		1.03	1.10	1.09
Adjusted dependency ratio based on actual labour capacity: (S-L) / L		***1.39***	***1.31***	***1.32***

Alternative 2: Labour capacity to adult-equivalent calorie needs

The second alternative is an untested method presented here for discussion. It uses the same denominator as the previous version (L = actual labour capacity), but in place of crude household size it employs a calorie-based adult equivalent scale to adjust the numerator (C = consumption needs) for household age and gender composition. The formula is simply C/L, with L calculated as previously explained and C derived from the conversion factors explained below.

Table A5 illustrates the kind of conversion factors that could be used to sum a household's energy requirements in terms of 'adult male equivalents'. Taking the daily energy requirement of a male aged 20–59 (2,460 kilocalories on this scale [39]) as "1", the ratios for males and females of other age groups are calculated simply as their daily requirement divided by 2,460. These figures are not suggested as actual energy requirements for relief rations or any other purpose: the table simply uses the *relative* energy requirements of different age and gender groups as a means of estimating the household's *relative* consumption needs according to its size and demographic composition. Of course, a family's actual consumption needs go far beyond minimum energy requirements: even in nutritional terms, calories alone are an incomplete measure of food needs. They are used here as a proxy for basic consumption needs – an appropriate indicator, it was felt, in a context where food insecurity and malnutrition are the most obvious outcomes of destitution. Technically, it is also a reasonable simplifying assumption given the very high share of food in total consumption in rural Wollo (calorie-based scales become less reliable proxies for total consumption as the share of non-food consumption rises). In other contexts, economists have based adult equivalent scales on surveys of actual household consumption behaviour, including non-food items such as schooling, clothes, medicine, and even alcohol and tobacco (White and Masset 2003).

Table A5 Conversion factors for a simplified calorie-based Adult Equivalent Scale

	Male		Female	
Age group	**kcal / day**	**= adult male equivalent**	**kcal / day**	**= adult male equivalent**
0 – 4	1320	**0.54**	1250	**0.51**
5 – 9	1980	**0.80**	1730	**0.70**
10 – 14	2370	**0.96**	2040	**0.83**
15 – 19	2700	**1.10**	2120	**0.86**
20 – 59	**2460**	**1.00**	1990	**0.81**
60+	2010	**0.82**	1780	**0.72**
Data source for kcal requirements: WFP 2000 (see footnote)				

Table A6 shows the calculation of this alternative measure of dependency (which we will call the 'real dependency ratio') for two example households. In the first household, two of the adult men are unable to work due to disability and chronic illness, while the teenage daughter is not contributing a full adult workload to the household.[40] The second household is identical in size and composition, but is unaffected

[39] There is no universal nutrition-based adult equivalent scale, since the actual calorie requirement for an individual is affected not only by age and gender but also by physical activity level; health, nutritional and physiological status (including pregnancy or lactation, and illness); and environmental temperature. The figures used in this table are WHO estimates for emergency-affected populations in developing countries, assuming "light" activity levels and a warm climate (WFP 2000: 121, 63–4).

[40] Based on cases encountered during the fieldwork, there are several possible reasons why a sixteen-year-old might be described as 'not able to do a full adult workload': she could be at school, or she could be partially disabled (physically or mentally), or chronically weak due to poor health or nutrition.

by chronic illness or disability. The standard age-based dependency ratio is, of course, the same for both households: 2/4 or 0.5 (2 people aged under 16 or over 59, to 4 people of "working age"). The real dependency ratio, by contrast, shows the difference in the two households' situation. By this calculation the ill and disabled household actually has a dependency burden of 2.4 (the equivalent of 5 adults' consumption need, to 2.1 adults' working capacity) – more than double that of household *b)*, with the same composition but no health problems.

Table A6 "Real" dependency ratios for two example households

Household a): with chronic illness and disability

Age	Gender	Reported labour capacity	= Labour units	Consumption needs (adult male equivalents)
45	M	Chronically ill	0.0	1.00
20	F	Able-bodied adult	1.0	0.81
70	F	Elderly	0.5	0.72
18	M	Disabled	0	1.10
16	F	'Adult assistant'	0.6	0.83
3	M	Too young to work	0.0	0.54
			2.1 [L]	**5 [C]**
			'Real dependency ratio' (C/L) = 5 / 2.1 = 2.4	

Household b): same household composition, with no chronic illness or disability

Age	Gender	Reported labour capacity	= Labour units	Consumption needs (adult male equivalents)
45	M	Able-bodied adult	1.0	1.00
20	F	Able-bodied adult	1.0	0.81
70	F	Elderly	0.5	0.72
18	M	Able-bodied adult	1.0	1.10
16	F	Able-bodied adult	1.0	0.83
3	M	Too young to work	0.0	0.54
			4.5 [L]	**5 [C]**
			'Real dependency ratio' (C/L) = 5 / 4.5 = 1.1	

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